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The Farmer's Digest

Volume 8 November, 1944 Number 6

Man with a Bull-Tongue Scooter

Condensed from The Atlanta Constitution

Harold Martin

THIS is a story about a man to whom the next generation may be erecting monuments as one of the greatest men this section of the country ever produced.

His name is Mack Gowder. He is sixty-one years old and he lives in the Dewberry community of Hall county, eight miles northeast of Gainesville, Georgia. And already, though he lives far off the main road and his place is hard to find unless you know the way, the world is beginning to beat a footpath to his door to view the better mousetrap he has built.

He is just an ordinary looking fellow, red-headed, blue-eyed, and a little stooped from work. He wears an old felt hat with spots of oil on it, and an old brown coat that is torn, and the faded blue overalls that many a Georgia farmer wears, and he sees no sense in shaving during the week.

He lives in just an ordinary house—tin-roofed and unpainted, with lightning-rods at the corners, and there is nothing unusual about it except the fact that all the food that's in it — and there is plenty—except the sugar and the salt and the coffee and the pepper, he raised himself on his own place.

His barn is a log barn and his outbuildings sort of lean against the wind like everybody else's, and there is nothing unusual about them either, except that at this time of year, when nearly everybody is having to buy feed, he has got feed to sell and his stock are eating oats right now he cut year before last.

There is nothing unusual about his car, which is a Buick nearly 10 years old, and his truck, which is an old International, 15 years old, and his wagon and his mules and his other gear, which is just about the same as you will see around any other farm.

The main thing about Mack Gowder is his farm, for there is

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no farm like it in Georgia. It sits like a garden of Eden, green and lush among the eroded hills, and the soil upon it is as deep and rich as if it were virgin soil that had never known a plow. It is as rich as bottom land, though every inch of it is steep and sloping land, just like land around it which shows great gullies like open wounds, and huge scalds where sheet erosion has washed the soil away.

It lies in a horseshoe-shaped cup in a fold of the hills and its slopes drop from 15 to 20 feet to the hundred, though nearly anybody will tell you that you can't farm land that steep without it washing away.

Looking at it this time of year, while Mack Gowder is getting ready to plant, except for fields where the grain grows thick and green, you'd think it was the sorriest place you ever saw.

The fields ready for planting don't lie smooth and bare to the wind and the sun and the rain like the fields on other farms. They are covered with trash and litter — cornstalks and cottonstalks and stubbly peavines and the weeds that sprang up in them during the winter.

It looks that way now and it will look that way when he plants, and it will continue to look that way right on, until the crops spring up to cover this trash and Mack Gowder starts harvesting his cotton and his corn and his grain in quantities three or four times as great as the average for his county.

He knows why this is, and he is willing to tell anybody that will come to see him and ask him about it, and he will come outside to talk about it to people gathering in groups whenever they ask him to. He doesn't talk about what he has done in any bragging way. He just explains it so that anybody can understand it, and if a body doesn't believe what he says is true, it's all right with him.

All they've got to do is to look at the steep slopes of his fields where the soil never washes away and look at his barn, bulging with feed for his stock, and his pantry, packed with food for his family. And if they are of a mind to, they can climb his steep terraces and go right up on the steepest slope, where you'd think the soil would be thin and bleached out, and pick up a handful of it and see how black and mellow it is for eight inches underground.

If they still needed convincing they could look at his books and see where for thirty years, in dry seasons and wet, he has always made money. And if they would ask him for his secret—the main thing that is the basis for his prosperity — he would tell them in a few words:

"Throw away your turn plow. Leave everything on the land you don't have to take off or sell. And let the clay stay where God Almighty put it—down under the ground."

Forty years ago, when Mack Gowder was a tenant farmer working the other man's land, he started studying about what it was that was causing the land to wash away and wear out, and he came to the simple conclusion that the turn-plow was causing it, by burying the litter that lies on the land after a crop is gathered.

To keep the land productive, he figured, you had to keep a good mulch on the top of the ground to hold the water on the soil, and at the same time you had to break up the ground so the water could soak in as it fell. You had to keep the plant food up close to the top of the ground where the roots of the plant could feed on it.

He figured these things out thirty years before Mr. Faulkner wrote his book called Plowman's Folly, which has caused such a stir the past couple of years among all cultivators of the soil from plantation owners to victory gardeners.

But there wasn't much to do about it so long as he worked the other man's land. So he saved what he made as a tenant until he got enough to buy a piece of land and he bought himself 100 acres of woodland, there in the Dewberry community of Hall county, about three miles from the place he had been working as a tenant.

"It hadn't been cleared," he said, "except in a few little spots that had just been hammer-hacked and gouged around in, and I knew that starting out from new ground like this I could find out whether or not I was right or wrong in the ways I had figured out of saving the soil."

He rented a few acres to cultivate while he started clearing his land and right there he did the first thing that was different. He didn't burn anything but the biggest brush. The little limbs and trash that were left after he took the timber off he left lying on the ground to rot.

When it came time to plow he knew there was no plow made that would handle the soil exactly as he wanted it handled, so he had to make his own. He took an old road scrape blade and hammered a slight curve in a section of it about 14 inches long and about 4½ inches wide, and put a sharp point on it and fastened it on to a two-horse turner beam. He hitched up and tried it out and it went down deep, about 12 to 14 inches, just enough to go into the top of the clay, and it rooted through the earth like a mole. It broke up the earth deep, but it left all the trash and litter

lying right there on the top of the ground.

Then he got a disk harrow and went over the ground that he had broken up with his home-made plow-point that he called a bull-tongue scooter, and the harrow chopped up all the debris that the scooter left lying on the top of the ground, and left it there on top, mixed up with about an inch or two of dirt.

He had cleared about 30 acres and he plowed it all this way and he planted on it. He didn't build any terraces the first few years. He wanted to see if this mulchy top soil would hold by itself.

It did hold except in the very heaviest gullywashing rains, though it lay on a 20-degree slope. The hard rains made a few little washes, the beginning of trouble, so he built his terraces then.

The crops he made in those first few years, and the way his soil stayed on the slopes, convinced him that he had hit on the right system. With a bull-tongue scooter and good bench terraces, backed up with a deep channel, he could save the soil.

He has been farming that way now for thirty years, and he believes his land is just as deep and rich today as it was the day he cleared it, thirty years ago.

About ten years ago he had another idea. He figured if what he was doing could save good land and keep it from washing away the same system could be used to build up land that was worn out and eroded badly.

So he bought himself 8 or 9 acres that joined his place. It was land that had been broken with a turn-plow all the time that he had farmed with his scooter, and it had almost completely washed away.

He walked over it the other day with me and Reese Dunson of the Soil Conservation office at Gainesville. "Right here," he said, "was a wash that a mule couldn't cross. It was a gully six or eight feet deep. Over there was another one." He pointed out these places that had once been deep washes, but we couldn't tell where they had been, so completely had he restored the soil.

"It will be a long time," he said, "before the accumulation of trash and litter can build up this land to where it is as good as my original land. But right now it is making three to four times as much as it was when I took it over, and there is not a wash on it anywhere."

There on top of the eroded hill he had restored to fruitful production he took off his hat and talked about the land as a man of the church might talk about his faith, with a depth of feeling that was almost religious.

"I love the soil better than any man in the world, I reckon, or

just as good," he said. "And to my mind a man who abuses it is committing a mortal sin."

Mack Gowder, practices conservation in many other ways. He never wastes anything.

Tin funnels cost a dime at the hardware store. Mack Gowder makes his out of gourds. When he has to buy something in town, he takes a load of wood to sell for enough to pay for it. He cuts this wood from the diseased and twisted trees on his 75 acres of woodland, and by so "farming" his woods over a period of years he has got a thriving stand of saw timber coming along.

But these little frugalities are not the secret of Mack Gowder's success. Many another farmer not doing nearly so well is just as "saving" by nature.

Mack Gowder stands alone because of his methods of tilling the soil. And to show in some detail how his methods differ, it is necessary to follow him from winter plowing to fall harvest.

With his bull-tongue scooter that does not turn the soil he breaks his land for sowing grain in late September and early October. He chops up the debris left lying on top with a disc harrow, stirring the litter into the first inch or two of soil. He plants three pecks to a bushel per acre, planting with a regular oat drill, and he puts in 100 to 150 pounds of commercial fertilizer per acre.

He does not top dress in the spring, like most folks, yet he makes 50 bushels of oats per acre against a county average of less than 25, and he makes 25 to 40 bushels of wheat when the county averages about 10.

From October to Christmas he prepares the land for the next spring's row crops. He sets the bull-tongue scooter to root through the soil from 12 to 14 inches deep, going into the clay from three to four inches, but turning none of it up, and leaving all the debris on the ground to soak and rot in the winter rains.

In the spring he harrows this planting, his rows, of course, following the contours of the hills. His planting methods differ a little from the average, too. He plants everything "flat." He lays off for corn with the bull-tongue scooter with a pair of wings on it, which puts the corn in a shallow trough. He does not box-bed for corn which puts the seed down close to the clay. He plants his corn in five and six foot rows and plants 12 inches in the drill, which is thicker corn in wider rows that most folks prefer.

He puts in no fertilizer at planting, but sidedresses with 4-8-4—about 300 pounds to the acre—when the corn is knee high and gives it 100 pounds of nitrate of soda to the acre when it is just ready to tassel out.

He cultivates with a scrape,

plowing often but just barely breaking the surface, and at the last cultivation, he sows a bushel of peas to the acre, scratching them in with a gee-whiz.

This way he makes 50 to 75 bushels of corn to the acre and he has made as high as 90 bushels to the acre, which is bottomland production on steep upland. "I always have enough to do me and some to sell," he says.

Planting cotton, he does not put in the fertilizer and then bed on that but drops 200 to 250 pounds of fertilizer to the acre as he lays off and comes right behind that with the planter, planting flat instead of bedding. He sets his planter to drop the seed from three to four inches apart and he never has to chop cotton. He may do a little thinning by hand, but not often. He plants in rows four feet apart instead of three feet, to let in plenty of sunshine.

He cultivates a little more than he does with corn, but he never side-dresses and he never poisons for the boll weevil. He goes through about twice with a hoe but there is never much to do.

Normally, before the boll weevil, he made from a bale and a half to the acre to three and a half bales on two acres. The weevil now gets about a half bale per acre, and his year-in-and-year-out average is a bale to the acre. The country average is less than a half bale.

He always follows grain with peas or soybeans, and he never row crops the same land twice in succession.

His method of farming is both harder and easier than the turn-plow system. It takes a little longer to prepare the soil, for the bull-tongue scooter does not take as big a bite as the turn-plow. Later on, though, it is easier because his crops get such a start they choke out a lot of the grass, and the grass and weeds are easier to kill because the land is so mellow it breaks away from their roots instead of clodding up when he plows.

He read "Plowman's Folly" with no surprise, for it told him little he hadn't proved, long ago. He differs with it in one respect. He thinks the land must be broken deep so the water can go down, where "Plowman's Folly" says the surface mulch is all the water-retainer needed. He does not argue the point, he just believes otherwise from his own experience.

One thing he does know. He has made money on his farm every year for 30 years, in good seasons and bad. And though the hills around him are eroded, his steep slopes still are as deep in good rich topsoil as they were the day they were cleared.

The "Alkali Reserve" and Staying Power in Horses

Condensed from The Horse

Lieut.-Col. Emil Engel

THE research chemist in nutrition has brought to our attention in the last decade many important truths which, when applied to the feeding of horses, helps materially in their general health, vigor, speed, staying power and soundness.

A. V. Hill in his "Muscular Activity" says that "it would seem probable that the limit to which it is possible to press a muscle is determined by the amount of alkali within it capable of neutralizing the acid products of its activity." He further states that "training may consist to some degree in an increase in the amount and disposition of the available alkali."

The farmer knows that after repeatedly cropping a soil an acid condition develops in which medium plant nutrition is so much impaired that yields become small and unprofitable. To correct this he frequently limes his soil to neutralize the acids that are formed by the decay of vegetable matter. A like situation can develop in the body of an animal. Certain foods after assimilation are acid forming while others are base or alkali forming. Acids if permitted to remain in contact with organic tissue any length of time are harmful and must be neutralized. Henderson, an authority on this subject, writes that "neutrality is a definite fundamental and important characteristic of the organism." Sherman, another authority, writes that "the normal processes of metabolism, however, involve a continual production of acid (chiefly carbonic, phosphoric and sulphuric) which must be disposed of in order to maintain this neutrality."

When the food of a horse is rich in calcium, magnesium, sodium and potassium, these alkali salts enrich the blood stream, tissues and tissue fluids, so that neutralization takes place promptly and the resulting products are later eliminated in the urine, feces, or skin. This, however, causes a definite loss of these alkalies in the blood stream which decreases the capacity of the blood for combining with carbon dioxide formed in all muscu-

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lar activity, which accumulation causes an increase in the respiratory function. If the muscular activity is moderate a "steady state" (second wind) is reached at which pace the animal can go for hours. If it is so violent that the heart and lungs are working to their limit, then the accumulation of carbon dioxide which cannot be held by the alkaline sodium salts in the blood serum is so great that it causes breathlessness which automatically stops further muscular activity.

If the daily food supply of a horse in training is not rich in the alkaline food salts needed to neutralize the acids formed, it makes up the deficiency by taking them from the various tissue and tissue fluids that are especially rich in them, thus weakening or impairing their function. Nature seems to have the faculty of switching its various substances to where they are most needed. It robs Peter to pay Paul.

The life of the cells of the various tissues varies. Blood corpuscles only live about six weeks. When there is a food deficiency over a period of time it is reflected in the tissue growth during that time. The hoof, growing from the coronary band downward, will clearly show a period of deficiency by its character of growth and texture. The teeth, growing from the root upward; the bones, growing from the periosteum inward, will also show it. When two year olds are put in training mineral deficiency shows itself as "shin buck" or inflammation of the periosteum, as training uses up mineral salts that normally would be going into growth. Splints show themselves in a like manner. Tendons growing inward from the sheath also show it as "bowed tendons."

In the natural state the food supply of the horse will be derived entirely from the various grasses, which are very rich in the alkaline food salts. When the animal is taken away from nature and fed grain, something that he gets very little of in nature, we are bringing about a decided change in the proportions of the various nutritive components of the food. If we study the table with this article we will find that all seeds are very rich in phosphorus. This element enters into the make-up of the nucleus of all cells. Nature assures to the seed a supply great enough to enable it to grow to such a size that its root system can get it from the soil. Phosphorus, however, although promoting growth, is acid forming when taken above the needs of the body and must be promptly eliminated, using up calcium and other food salts to do so. Foods rich in sulphur above the needs of the body must have it removed by neutralization like phosphorus.

The best proportions of the various food components are certainly those of an average of the grasses and clovers that we know from experience promote growth, vigor and endurance. These have been averaged in the table with this article and, if we study it, the excess of acid forming components in oats and bran as compared with the pasture grasses and hay will be evident.

It is generally believed that a greater amount of muscular activity requires a greater amount of protein. This is an error. Sherman says that "many experiments have shown conclusively that increased work, when accompanied by a sufficient increase in the amount of fats and carbohydrates fed, does not necessarily increase the metabolism of protein." Lusk, another authority, "considers it fully proved that neither the amount nor the character of protein metabolism is changed by muscular activity." Protein is very necessary during the growing period, being required by about twice as much per unit of weight as when the animal is fully grown.

Carbohydrates are the fuel of the animal and the greater the muscular activity the greater is the amount required. Unlike protein, which cannot be stored if taken in excess, carbohydrates are stored as fat. Carbohydrates when burned in muscular activity form acids which require sodium salts to neutralize them.

Fats burn in the fire of carbohydrates and when consumed act as fuel and require alkaline salts to remove their acid products.

Sulphur is absolutely essential in the make-up of protoplasm and in blood corpuscles and in its metabolism forms sulphuric acid which is neutralized by the sodium or potassium carbonate of the blood, which when eliminated carries away these important alkalies, thus decreasing the "alkali reserve" or "reserve alkalinity" of the blood.

Muscular tissue is made up largely of potassium phosphate, bony tissue of calcium phosphate, and nerve tissue of ammonium phosphate. Phosphorus, as previously stated, enters into the structure of all tissue cells. Potassium gives pliability to tissues, while calcium gives hardness. Linen made from flax grown on soil rich in potassium is soft and pliable, while that grown on soil rich in calcium is hard and rough. A dandelion growing in a crevice of a lime quarry into which some water constantly dripped was observed to grow to a height several times that of its companian growing in the soil of the neighboring valley rich in potassium. The stem of the smaller dandelion could be wrapped around the finger without breaking, while the one rich in calcium, although

much larger, would break when this was attempted.

The alkaline food salts, calcium, sodium, potassium, and magnesium, play a great part in preserving normal *osmotic pressure* throughout the cells of the various tissues. If they fall below the normal in the blood and tissue fluids every function of the body is slightly impaired. Fortunately nature carries a large reserve in the amount of these elements contained in the tissues and seems to incline to preserving a healthy amount in the blood stream and tissue fluids at the expense of the tissues themselves. Bones give up their calcium, thus weakening their structure although retaining their size and shape. Tendons and ligaments, all carrying large proportions of calcium, do likewise, making them very liable to "breakdown," especially when the animal is immature. Muscle cells give up their potassium and loose their tone and pliability, making them liable to rupture and soreness. In connection with potassium salts in muscles, it is rather interesting to learn that these salts are only absorbed into the muscle cells by *osmosis* when the muscle is contracted. This in part will explain the rapid wasting away of a muscle when an injury prevents its contraction; also the increase in size when it is constantly and regularly contracted.

Nerve tissue very likely undergoes a similar change as ammonia is utilized in nature to neutralize acid products of metabolism. "Staleness" in horses from over-training shows itself in a lack of desire for muscular activity. Protein here plays a part, as it is rich in nitrogen and the amino* acids which stimulate the nerves.

From all this it would seem that if we wish to preserve in our horse in training strength of bone, tendon and ligament, pliability of muscles, vigorous impulse in his nerves, we must maintain a food supply rich in the alkaline salts, with no excess of protein and an amount of carbohydrates and fat sufficient to meet the needs of the degree of muscular activity and the season of the year. An excess of alkali has never been observed to do any harm, while an excess of protein may do so.

The art of feeding cannot be acquired from books, although a knowledge of the various nutritive components and the part they play in nature will certainly help one to diagnose correctly his observations.

It has long been known to horsemen that oats alone are not entirely satisfactory. Oats if fed alone would in a few days bring about digestive disorders and the animal would refuse them. Pasture or its dried product, hay, is the basic food of horses. The good

*Hydrogen atoms replaced by ammonia.

trainer of horses is very particular about his hay. Go to the race track and look at the kind and quality of hay that the best trainers use. Note the large amount of carrots that are fed by some of the most successful trainers. It is interesting to know that when an equal weight of oats and carrots is fed, the excess acid forming elements in the oats are entirely neutralized by the excess alkali forming elements in the carrots. Apples require three times the weight of the oats fed to neutralize the excess acidity in oats. Beans are fed in Ireland with oats and their good effect is due to their excess alkalinity, which is even greater than carrots.

The use of horses for pleasure is growing all over the country. Their care in most cases is left entirely to grooms who in many cases are inexperienced observers. The writer had occasion this past season to observe a string of polo ponies that were stabled on his property. It was noted that the groom in charge fed very little hay and allowed them little or no grazing. They had been fed for the previous six months and perhaps much longer on food poor in the alkaline mineral salts, such as oats, corn and timothy hay. The horses constantly kicked the sides of their stalls and in two months had done more damage to the woodwork of the stable than had been done in the past five years. The groom was asked why he did not feed more hay and "grass them" and he replied that hay and grass put a stomach on a horse and that he did not believe in them. By June 30th, three months after the horses had been put in training, five out of nine of these polo ponies were lame. Many of my readers will call that simply "hard luck" and not a deficiency in the alkaline mineral salts over a long period of time.

Late in 1920 the writer was in charge of the Remount Depot at Camp Dix (First Division). There was a string of polo ponies there and all of them were sound and clean limbed. During the season of 1927 many of these same ponies were still with the First Division Polo Stables at Fort Hamilton. All of the active, free going, well bred ponies had in the past seven years developed enlarged or puffy joints or tendons or were "bowed." All the ponies that were sound were those with the reputation of being slow and lazy on the polo field. The food of these ponies during these years had been the regular forage issue of oats and best grade straight timothy with a little bran. No pasturage except an occasional "grassing," no alfalfa or clover hay or carrots. There was a deficiency of the alkaline mineral salts in this ration and all the ponies that had inherited in their good blood a "will to run" and

had done so, ignoring in so doing the warning of nature of a tendency to laziness, had gone unsound; while those that would not run had stayed sound. Now I know that many of my readers will call this theory wrong. They will blame the riders or the method of riding. If, however, they study the table with this article the deficiency in calcium in oats and straight timothy hay will be noted, and calcium gives hardness to everything that it enters into combination with in animal or plant life. It gives strength and durability to bones, tissues and tissue fluids. Kellogg says that "calcium is a regulator of the nutritive processes. It is essential for heart action and muscle action and constitutes an essential element of the blood and tissue fluids, as well as of the brain, nerves, glands and other living structures."

Iron has but one important job and that is to carry oxygen to wherever it is needed. This is done through the medium of the red blood corpuscles in the blood stream. Iron loves oxygen. During respiration it combines with it very easily in the red blood corpuscles which consist of iron, calcium and sulphur. Although very little iron is needed it must be renewed very frequently, as the life of a blood corpuscle is relatively short. The greater the need for oxygen the more sulphur is associated with the iron in the red corpuscles. Quoting from Carque, we find that "upon the iron content of the blood depends, in the last analysis, not only its oxidation and circulation, but also the degree of vitality of the body. As Faraday demonstrated, the ferruginous blood is of magnetic nature." It is not only necessary that oxygen enter the lungs but that it should be actually absorbed into the system by the action of a sufficient number of red corpuscles.

Sulphur in the body acts as a check on the phosphorus. Where rapid growth is desired phosphorus is in excess of sulphur. This shows itself in our table when we compare these proportions in seeds and in the grasses. Many abnormal growths in the body are due to a large supply of phosphorus and nitrogenous foods and a deficiency in sulphur, sodium, calcium and iron. Sulphur accumulates in the skin, sinews and hair. Sulphur, like silicon, has good insulating power which holds the electricity of the body together, preventing its premature and too rapid dissipation, and at the same time giving to those parts containing it softness, pliability and elasticity.

Magnesia is associated with lime, thereby increasing the hardness. The greater the proportion of magnesia, the more resistance to decay. Teeth carry more than

bones and the tusks of elephants carry a greater proportion than teeth, hence their great durability.

Silicon is a protective agent against chemical disintegration and putrefaction. The mineral matter in healthy muscular tissue contains silica. It is also found to a considerable extent in the hair and hoofs. Silica, like sulphur, is a good insulator and is found largely in the connective tissue.

Chlorine in the form of sodium chloride plays an important part in animal nutrition. It assists in the formation of all the digestive juices. The blood serum is largely made up of sodium chloride, which favors and sustains the generation and conduction of electric currents. Due to its importance, people have an erroneous idea and feed the inorganic salt in large quantities. Whenever this is done, it draws fluids from the tissues rapidly, and there follows an increased discharge of urine, greatly exceeding the quantity of water ingested. Excessive thirst then follows. The kidneys then have added work to do until the inorganic salt is eliminated. Animals that are very thin seem to have a desire for salt, which seems to be very beneficial to them, as it probably acts like the normal salt solution that the surgeon injects into the body after an operation which has caused a great loss of blood. It is not a good practice to add salt to the feed of horses. Let them have access to rock salt and it will be observed that healthy animals only lick it occasionally. When animals hang around the salt box you may safely suspect that there is a diet deficiency in your pasture or feed.

In conclusion, and to complete this brief study of nutrition, a summary of our present knowledge of vitamins A, B and C is quoted from Dr. Robert McCarrison:

"(1) Vitamins are constant constituents of living tissues. Although present in small amounts, maintenance of health is dependent on their action.

"(2) Vitamins do not themselves contribute to the energy supply of the body, but facilitate utilization by it of proteins, fats, carbohydrates and salts of food.

"(3) Proteins, fats, carbohydrates and salts cannot support life without vitamins, nor vitamins without these proximate principles; they are complementary to each other. Without vitamins the body starves.

"(4) A distinct relationship exists between the amount of vitamin required and the balance of food in protein, fat, carbohydrate and salt, the efficacy of the vitamin depending upon the composition of the food mixture.

"(5) A distinct relation exists between the amount of vitamin required and the rate of metabolic process.

"(6) Each vitamin plays a specific part in nutrition.

"(7) It appears that vitamin A is associated with the metabolism of liquids and calcium, as well as chemical reactions requisite for growth and maintenance.

"(8) Vitamin B appears to be associated with the metabolism of carbohydrates and with the chemical reactions and functional perfection of all cells, particularly nerve cells.

"(9) Vitamin C appears to be associated with the metabolism of calcium and with the chemical reactions of growing tissues.

"(10) All vitamins are concerned in the maintenance of orderly balance between destructive and constructive cellular processes.

"(11) One vitamin cannot replace another, although its function may be interfered with by the absence of another.

"(12) The final result of their efficiency is the same, whatever be the degree of deprivation. The greater the deprivation the more rapid is the onset of symptoms due to it; the lesser the deprivation the slower is the onset of the symptoms due to it.

"(13) Each vitamin exercises a specific influence on the adrenal glands; the effect of their deprivation on these organs is one of the most outstanding features of deficiency diseases.

"(14) Vitamins influence markedly the production of hormones and all external secretions.

"(15) There is reason to believe that the capacity of any given cell for work is impaired in proportion to the degree of vitamin starvation.

"(16) Vitamins aid the tissues in resisting infection.

"(17) Vitamins, especially vitamin B, induce in the human and animal body a desire for food.

"(18) Vitamins are one link in the chain of essential substances requisite for harmonious regulation of chemical processes of healthy cellular action. If the link be broken, harmony ceases or becomes discord as it may cease or become discord if any other link be broken.

"(19) The place of vitamins in human economy must be considered in connection with metabolism as a whole, in connection with their relation to other essential food requisites, with their relation to organs of digestion and assimilation, and with their relation to endocrine regulators of metabolic processes.

"Vitamins are the spark which ignites the fuel mixture of a petrol-driven engine, liberating its

energy; a spark is of no use without fuel, nor fuel without spark—nay, more, the efficacy of the spark is dependent in a great measure on the composition of the fuel mixture.

"What happens when the body goes sick in consequence of deficient foods, usually ill-balanced, is this: In the absence of vitamins, or in an adequate supply, protein, fat, carbohydrates and salts are not properly neutralized; some are largely wasted, others yield products harmful to the organism. In these circumstances, life may be sustained for a longer or shorter period, during which the body utilizes its reserve stores of vitamins and sacrifices its less important tissues to this end. But there is a limit beyond which such stores cannot be drawn upon, and once reached, the cells of higher function — secretory, endocrine and nerve cells —begin to lack vigor and depreciate in functional capacity, although the tissues may still hold considerable stores of vitamins. The disintegration process is delayed or hastened, lessened in severity in one direction or increased in another, according as the food constituents are well or ill-balanced and according to the character of lack of balance."

We pride ourselves on our large Thoroughbred horses and their rapid growth and early maturity. Oats and bran with their high phosphorus and protein content, with pasture which is rich in mineral salts and vitamins, are mainly responsible. Having matured, however, we should lessen the phosphorus and protein to the bare needs and keep up the mineral salts and vitamins by grazing.

Horses that are kept up and fed grain and hay cannot consume enough carrots and grass by "grassing" to meet their needs in vitamins and there is a constant drain on the reserves of the animal. After about six months or less of this the horse will give you the impression that he is tired. He has to be kicked along to make him run his best. The animal however is in excellent flesh. This tendency to laziness is nature's signal to go slowly. The animal has been using up his reserve mineral and vitamin supply and the tone of the tissues is now feeling it. Our remedy is to throw the animal out of training and send him out to pasture where the reserves of alkaline salts and vitamins can be replenished. When the animal is again put in training you will notice a desire to run for the pure love of running.

The "alkali reserve" is not a theory but an important discovery which explains the wonderful endurance of horses taken from the range and given a very hard and long ride.

DIGESTIVE NUTRIENTS AND MINERAL MATTER IN 100 POUNDS OF REPRESENTATIVE FEEDING STUFFS

					ALKALI FORMING					ACID FORMING			VITAMINS		
	Protein	Crude Carbo-hydrates	Fat	Nutritive Ratio	Potash	Soda	Lime	Magnesia	Iron	Sul-phur	Phos-phates	Silicon	Chlorine	A	B	C
Blue Grass Hay	4.7	43.5	1.5	1:10	2.10	.17	.43	.36	...	.77	.54	...	.215	?	?	?
Timothy Hay	3.0	42.8	1.2	1:15	1.36	.43	.25	.17	.037	.37	.31	1.42	.183	**	*	—
Alfalfa Hay	10.6	39.0	0.9	1:4	2.23	.56	1.95	.59	.168	.78	.54	.81	.474	***	**	—
Red Clover Hay	7.6	39.3	1.8	1:6	1.63	.12	1.60	.45	.067	.44	.39	.17	.230	***	**	—
Average Optimal Proportions	**6.5**	**41.1**	**1.3**	**1:9**	**1.83**	**.32**	**1.06**	**.39**	**.068**	**.59**	**.44**	**.60**	**.28**	Pas ***	tu **	re ****
Oats	9.7	52.1	3.8	1:6	.56	.23	.14	.20	.038	.49	.81	1.25	.070	—	**	—
Corn, Yellow	7.5	67.8	4.6	1:10	.40	.04	.02	.18	.011	.38	.69	.03	.065	**	**	—
Bran, Wheat	12.5	41.6	3.0	1:4	1.62	.24	.09	.73	.034	.67	2.95	.08	.090	—	**	—
Carrots, Yellow	1.0	9.4	.2	1:9	.36	.20	.11	.05	.01	.06	.13	.02	.046	**	**	**

Note: The following data were taken from Henry and Morrison's "Feeds and Feeding" and other sources:

Under VITAMINS:

? represents no data.
— represents little or none.
* represents a small amount.
** represents a good source.
*** represents an excellent source.
**** represents an exceptionally rich supply.

The "average optimal proportions" were computed by the writer as the best proportions that we should strive to maintain in our feeding standards to insure an "alkali reserve."—Author

Farm Service Buildings—Assets or Liabilities

Condensed from Agricultural Engineering

Ray Crow

Research Engineer, Tennessee Coal, Iron and Railroad Co.

A FARM building or other structure that does not pay its way is a liability. To pay its way the presence and operation of the structure on a farm must increase that farm's income by an amount that will at least maintain the structure and amortize its cost during its useful life. Any sum realized above this minimum is net profit to the farm operations. If there is no net profit realized, the structure certainly is not an asset and something should be done about it.

Unfortunately, however, farm structures are seldom predicated on this basis. Too often they are based on personal whims, prejudices or structures built elsewhere, rather than on actual studies of what is specifically needed. In such cases the individual responsible for the design will be loath to admit any inadequacy, and since this is often the owner the structure will be continued in operation with attendant unnecessary loss.

Or, the structure may be built down to a price rather than up to a performance. The daily saving of one hour of chore labor at 25c per hr will amortize an initial investment of $1500 at 5 per cent interest over a period of 30 years. The efficient expenditure of much less than $1500 for labor-saving devices or arrangements in the construction or remodeling of an otherwise conventional but sizable farm structures layout generally can be made to save one chore hour per day. Yet how many farmers, or farm structures engineers for that matter, design on this basis. An engineer in industry that failed to take such items into account in designing housing for industrial manufacturing plants would not get very far.

Many farm structures designers think of service buildings primarily as conventional adjuncts to rather than active components of the farm operations. That is, the buildings are desirable as shelters from the weather thus adding somewhat to the comfort of animals and operators, but actually contribute little or nothing in the way of increased income.

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One reason for this attitude is that structures are static. The results of their operations are not so readily subject to analysis and quick evaluation as are the dynamic operations of farm machinery, electric equipment, or even the increased yield of a farm crop due to an improved system of culture and fertilization. It is not realized that efficient farm structures round out and complement the entire farm operations by being instrumental in preserving and retaining at least a large part of the gains made by breeding better and more efficient grades of livestock; producing more prolific and nutritious grains, hays and other livestock feeds, or the increased yields of commercial crops brought about by soil improvement and better cultural and harvesting methods.

It is possible to raise poultry in most areas of the South without any structures erected for that specific purpose. Domestic fowls are yet so near the wild state that instinct impels them to roost in trees, on fences or in other as nearly safe locations as they can find, when permitted to run loose. However, if this system of poultry production were followed exclusively throughout the country, the farmers of the nation would not have been able to sell chickens and eggs to the net cash value of well toward $400,000,000 as was the case in 1939 according to a U. S. Census report. Somewhat similar analogies could be made for other branches of livestock production.

All agricultural engineers can agree that farm structures are essential to enable the farmers to produce sufficient livestock and livestock products to supply the total consuming needs of the country, and if that is so then certainly their design, construction, and operation deserve as careful study and consideration as any other phase of farm operation. Unfortunately these aspects are often disregarded.

A farm building may fail to pay its cost in various ways. It may give so little protection to its contents that it has no real value for this purpose. It may be so inconveniently arranged as to require excessive labor for operation. Or it may be so expensively built that the amortization cost is out of line with the profits that it makes.

An example of the latter was disclosed within the last year or so in a southeastern state. Due to the location of army camps the demand for graded milk was increased materially. A wholesale dairyman undertook to encourage farmers producers of ungraded milk to change over to classified production, and other farmers to enter this type of dairying. He found prevailing a general widespread impression that the min-

imum cost of building and equipment necessary for such production was at least $2,000. The average value of the farm herds was no more than this and the owners did not feel that such an expenditure was justified.

But this dairyman was housing and milking his own herd of purebred cows valued at $40,000 in a structure worth not more than $2,000. Why was it necessary for the owner of a small herd to have an equal investment in structures and equipment? He found that it wasn't. He put the problem up to the head of the agricultural engineering department of the state agricultural college of his state and the result was a $675 barn (wartime cost) that complied with the health department regulation. Even this penalizes the small producer seriously. The overhead cost of an investment of $675 to provide such facilities for a $2,000 herd is proportionately far greater than is one of $2,000 to provide such facilities for a $40,000 herd.

Under the circumstances, the engineer in question did a good job, promptly and efficiently. This is evidenced by the fact that although the plan was drawn up practically overnight, few changes have been made in the original design. Yet the fact remains that it took a war and the instigation of a commercial operator to develop the fact that a minimum-size, graded milk producing structure could be erected for approximately one-third the cost that had previously been considered necessary.

Many farm service buildings do not pay their way through no fault of their own. For instance, the income from the sale of milk from a herd of scrub cows probably will not be sufficient to pay for even the feed consumed, to say nothing of the labor and overhead involved, even though housed under ideal conditions and given the best of care. Such a herd is in itself a liability and any structures built for it simply increase that liability. On the other hand, a herd of high-producing cows may, within certain limits, increase milk production sufficiently in proportion to feed and labor requirements to warrant a considerable increase in cost for better buildings.

However, the determination of the limitations mentioned are important factors. It is an easy matter to design and build a good dairy barn if cost is no object. I inspected a new group of buildings of this type some three years ago, built by a nationally known firm that specializes in such work, to accommodate a herd of 175 cows for a wealthy business man who farms on the side. The proud owner assured me that the cost was only $50,000 all complete, including three dwellings for

workers. This is just under $300 per cow, approximately one-third the total value of the complete building layout including the residence on the average southeastern farm.

Possibly the operation of this particular herd can show a profit even when burdened with such a capital charge. My considered opinion is that the structure is largely a liability in the sense that one-third to one-half this investment could have been made to serve equally well. Contrast this with the previously mentioned case of a highly successful commercial dairyman who milked and cared for 120 cows in a barn valued at $2,000, amounting to less than $20 per cow.

Somewhere between such extremes lies a point of greatest net income efficiency. To determine it is not an easy task. It requires the application of much more than merely engineering talent and structural skill. There must be a coordination and correlation of information pertaining to all the activities of the particular farm in question. Yet how often do those of us who are interested in design and construction receive postcards saying simply, "Please send me plan for a 40-cow dairy barn." Not a word of explanation as to the type of herd to be housed; what feeding practices are considered; what part, if any, of the feed is produced locally; whether graded or unclassified milk is to be produced; no information as to whether this is for expansion of present operations or a new venture; no data as to the dependence on pasture, or, in fact, anything except that a structure is desired. The worst way to answer such a request is simply to pull out of the files a copy of some plan on hand that comes nearest to what the inquirer appears to think he wants, and mail it.

It may not be at all the type of structure he should erect for his particular needs. Yet he may build it and unwittingly be stuck with a liability for years to come. The best course is to refuse to furnish any plan without more information. This illustrates both the opportunity and responsibility not only of the structures specialists among agricultural engineers but also that of other specialists as well. There should be a much closer liaison among all these various specialists with respect to structures than generally exists. Furthermore, the specialists along any particular line in regional areas in which similar climatic and farming conditions exist should in some way get together on recommendations for functional requirements of farm structures. This would assist the structures men materially in reducing the number of structural liabilities.

A start has been made in this direction by the U. S. Department of Agriculture. A couple of years ago a group of building material producers submitted a request to the Department to supply the public with average functional standards for poultry houses, hog houses and dairy barns based on the climatic zones throughout the country. The first response was that these data already existed. Later it was conceded that they did not, but the subject was considered sufficiently important to have committees appointed from among the specialists of the department to draw up such functional standards for each of the three types of structures. At the end of two years the recommended standards for the hog house have been completed and the others are well under way. This information will tend to produce better service buildings but is not the complete answer.

My observation indicates that throughout most of the southeastern states the tendency is to overbuild for livestock shelters but to underbuild for labor-saving devices, conveniences for the animals and the operators, and (very definitely so) for storage and processing buildings as well as for fencing layouts. I consider the latter of prime importance as assets.

Properly arranged and efficiently operated fenced fields and pastures which permit convenient rotation, and direct harvesting of crops by livestock will quickly pay for the fencing by saving of labor, increased fertility of soils and greater production.

It is well known that on southern farms loss of stored grain to rats, weevil and the inroads of weather is a large economic factor. Some reliable estimates place it as much as 20 to 25 per cent. With corn at 75c such a loss is 15c per bushel in one year. But this amount will build a container that will prevent practically all such annual losses for many years. Certainly then a container that permits even a part of such losses is an unnecessary liability.

It is generally conceded that expenditures made to protect livestock from cold in southern states are largely a loss of money, except in the case of caring for the young. This is particularly true with respect to animals being fattened for meat production. The digestion of the necessary food required for that purpose develops ample bodily heat to resist any reasonably low temperatures. However, shelter from cold rain, sleet and serious drafts, together with dry surfaces for feed and exercise lots are worth considerable outlay. Yet how frequently do you observe an expensively constructed barn forming an island in a sea of mud. A

part of the barn expenditure used in paving the lots or improving the drainage around it probably would be a sound investment.

Another underbuilt feature of livestock structures is water supply. Milk is well toward 90 per cent water, eggs approximately 70 percent, and meats well over half. Thus it is evident that water is essential to the quantity production of these items as well as being one of the lowest cost ingredients. An ample supply of fresh clean water made available at all times can be a large factor in turning a structure's liability into an asset. This has been shown repeatedly by actual experimental work. But even so, far too many farmers depend on their livestock finding drinking water in some swampy pond or inconveniently located creek.

As you doubtless have noted this is not a thesis on farm building construction. I have tried to indicate that there is a lot more to designing efficient farm structures than just selecting and assembling materials. That is a comparatively simple matter if the designer knows definitely just what purpose the completed structure is to serve. To determine this requires the assembly and correlation of data from many sources, frequently not available to the designer.

The animal husbandman, the horticulturist, the agronomist, the specialsts in land use, farm machinery, rural electrification and in many other lines, in the final analysis must consider structures as one of their important tools in developing greater and more efficient farm production. They may not be trained in selecting and assembling materials, but each can furnish the structures specialist with data as to what specific functions the structures should perform in any particular case. With the information at hand from these several sources and correlated with reference to the importance of each in the farm operations, the solution of the farm service structures problem is not far distant.

Root-Knot Can Be Controlled

Condensed from Florida Grower

J. R. Watson
Entomologist, Florida Experiment Station

ONE of the most destructive truck garden pests is root-knot. Soils that have been raising truck and garden crops for a number of years are almost sure to be infected, particularly if the soil is light and sandy and well drained.

The cause of this disease is a minute worm which, because of its small size and absence of color, is all but invisible to the naked eye. The females burrow deep into the roots of plants. As the result of their feeding, and a poison which they give off, the plant forms a large gall, something analogous perhaps to tumors or cancers in man. Here she lives from nineteen to seventy-seven days according to the temperature, longer of course, when the weather is cold. When full grown one female has been observed to lay as many as 1200 eggs.

Vegetable crops vary greatly as to their susceptibility to these worms. A few plants do not harbor nematodes at all, but practically all garden crops do to a greater or lesser extent. In the order of their injury by root-knot the truck and garden crops commonly grown in Florida are about as follows: the most severely injured is okra, followed by tomatoes, peppers, English peas, beans, watermelons, Irish potatoes, and most varieties of soy beans.

Most of the varieties of cowpeas also are injured badly, the Iron and Brabham (not table varieties) being exceptions.

Less severely damaged are such plants as lettuce, carrots, beets, sweet potatoes, mustard, radishes, and strawberries. Still less injured, in fact injured to an almost negligible extent, are onions, corn, cabbage, collards, and other members of the curbubit family. These can be grown profitably on heavily infested land.

Quickest way of destroying the worms in the soil is by fumigating the soil with hydrocyanic acid gas. The method consists in saturating the plowed or harrowed soil with a solution of sodium cyanide, followed immediately by a solution of ammonium

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sulfate, which is under restrictions applying at present but should be available in at least limited quantities through your regular fertilizer sources. These chemicals react to give off gas HCN, the killing agent.

Sodium cyanide is dissolved in water, the amount depending upon its accessibility. Immediately after the application the bed must be wet down about as far as nematodes penetrate, usually a foot or more. Very light sandy soils should be wet to a depth of two feet.

Immediately after the application of sodium cyanide an ammonium sulfate solution is poured over the surface of the soil in the same manner as the sodium cyanide and again wet down sufficiently to carry it to the same depth as the sodium cyanide solution. The bed should be covered promptly with some material to hold the gas—canvas, building paper, or even newspapers will answer. The cover should be left on for about 24 hours.

In medium light sandy soils from 600 to 1,000 pounds of sodium cyanide per acre is necessary to give thorough eradication. In very sandy soils, such as the pineapple soils of the lower East coast, doses as small as 300 pounds have given thorough eradication, whereas in heavier soils amounts up to 1200 or even 1500 pounds per acre are required. The amount of ammonium sulfate should be 50 per cent greater than that of sodium cyanide. That is to say, if 600 pounds of sodium cyanide is used per acre, 900 pounds of ammonium sulfate should be used. The ground may be planted within a week or 10 days after application, or as soon as it has become sufficiently dry.

One great advantage of this method, in addition to the short time necessary between treatment and planting is that it leaves the soil immensely rich in nitrogen. Plants grown on treated soil make very vigorous growth without the application of any more nitrogen. Radishes have grown as big as turnips, and other crops in proportion. A little phosphate and potash should be added to make a complete fertilizer.

Both the sodium cyanide and HCN gas are violent poisons, and one working with them must be careful. In applying, the worker should always keep his back to the wind. Be careful not to get the solution of sodium cyanide on the hands, and carefully wash the hands before eating. With precautions it is safe to use these materials in the open air. This treatment should not be used near dwellings which must be occupied during the treatment, or for a few hours afterwards, espec-

ially where the wind might blow the fumes toward sleeping quarters.

Neither should it be used too near living plants which the owner does not want killed. In practice, however, about 6 feet distance is sufficient for the protection of living plants. All plants on the treated plot will be killed with the exception of some larger weed seeds, such as coffee beans, and unusually tough and resistant parts of plants, such as underground stems of Bermuda grass. In addition to nematodes all insect life in the soil will be killed, including ants, white grubs, mole crickets, and other pests.

Sodium cyanide is not ordinarily on sale in most communities in large quantities, and must be ordered from the larger drug dealers in advance.

Because of expense this method is advised only for particularly valuable home gardens where cheaper methods are not practical. It will not always be necessary to treat the entire garden. One may treat only that portion where one wants to raise highly susceptible plants. Other portions of the garden can be left untreated.

Another method which is slow, but avoids the danger attending the use of HCN and demands only materials always available, is to soak the soil with hot water. Bury a few Irish or sweet potatoes in the soil about a foot deep. Pour boiling water on the soil until these potatoes are cooked. You can then be confident that you have killed off most of the nematodes.

Cheapest method to get rid of nematodes is to raise on the land during the summertime a cover crop in which nematodes will not live. Under most circumstances the best plant for this purpose is *Crotalaria spectabilis.*, with the big yellow blossoms and large pods. The crotalaria is planted, immediately after spring trucking season, in rows so that it can be cultivated frequently and given one or two hoeings. It is absolutely essential that all other vegetation be kept out, and that the soil be stirred frequently to let in plenty of air. If air is excluded the eggs may encyst and remain unhatched until the soil is aeriated again. During the summer heavy rains may compact the soil so that there is not sufficient air. Cultivation after every heavy rain or every week will prevent this danger. The crotalaria should be planted thick enough so that it will shade the ground in the latter part of the summer and early fall so as to prevent the growth of all weeds which may be hosts and make frequent cultivation less necessary.

Cattle in the Pines

Condensed from American Forests

R. S. Campbell and H. H. Biswell

PINEY woods cattle grazing is an important wartime industry. In the Atlantic and Gulf Coastal Plain area there were, on January 1, an estimated 7,500,000 cattle and calves, an increase of twenty percent in a half decade. These animals, the bulk of which graze on forest range during at least part of the year, produced in live weight the equivalent of nearly half the nation's beef demands for military and lend-lease. In addition, the forest supplies forage for a large part of 1,000,000 sheep in the area.

A few years ago forests would have ridiculed the idea of such production; even now, people unfamiliar with conditions in the South are inclined to deride southern forest grazing as an existing but unnecessary evil involving only scrub cattle owned by backwoodsmen who burn other people's woods to freshen up the grass. It is true that until a decade or so ago cattle in the Piney Woods were mostly native scrub stock, producing paltry calf crops with exorbitant losses. But this has changed. Today cattle on southern forest ranges are contributing a substantial share of livestock production—and therein lies a story of steady progress in research, education, public assistance and private initiative.

The southern range livestock industry did not grow up over night. Neither is the simple métier of the settlers who brought their half-wild Spanish cattle to the shores of Amichel (Gulf Coast) in the eighteenth century, and could "live and let live." It requires making the best use of hundreds of species of luxuriant grasses, weeds and shrubs—the familiar "rough" of the Piney Woods. It involves a thrifty and fecund type of animal, adapted to the hot, humid weather and usually low nutritional level. It means major adjustments in farm management to produce the increasing amounts of pasture, hay and concentrates needed to keep animals well fed and healthy, particularly during seasons when the forest range furnishes only a below-maintenance diet. It involves co-ordination with wildlife, the hunting and fishing so important to every southern farm boy—and his daddy. The same land that is

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grazed must be protected from careless burning, restocked by natural seeding or planting, with the stand improved to produce quantities of pulpwood, ties, poles, piling, sawlogs and naval stores.

The quickened interest in forest grazing and the many problems involved have led to the beginning of range research by the regional forest experiment stations of the U. S. Forest Service, in co-operation with other federal research bureaus and the state experiment station. Such studies already under way in the Coastal Plain of North Carolina, Georgia and Louisiana are showing that the problems of livestock raising in relation to forestry and farming are far from unsurmountable.

The most important detail in any picture of the southern forest range is its people—the average farm family with a forty- or eighty-acre farm and limited resources in soil fertility and crops, diet insufficient in beef and dairy products and restricted income, along with huge plantation owners or lumber companies with thousands of acres at their disposal. As would be expected in a forest region, grazing is complementary to the growing of wood products. Farm woodlots, making up nearly a third of the forest area, not only produce fuel and fence posts for the farmers' own use, but even now are the center of a nationwide drive for increased production of pulpwood. The remaining two-thirds of the area, with the exception of the five percent in public ownership, are largely in small, individual private timberland holdings, mostly second growth. Few of these owners fence the land or run cattle of their own. This permits a free range industry that began long before the old public domain grazing of the West, and causes many more problems in land control and use.

The dilemma of absentee ownership of large acreages and the restricted opportunity of the small farmer to make a living gravely handicap the application of improved management methods. Better control, through fencing and land management, is needed for the forest and for the animals. County by county, fence laws are slowly setting the stage for such control. In addition, study of forest grazing in Louisiana in 1943 revealed at least one way in which stockmen are overcoming the difficulty. In several cases, farmers arranged with the landowners to fence and graze up to 1,000 acres of forest land in return for protecting the area from fire and trespass. Such resident use and protection may offer the beginnings of restoration and more intensive management for large bodies of forest land now lying idle.

But good management of trees and livestock on the same area is beset by problems. Many foresters hold livestock responsible for serious damage to trees. However, repeated observations have demonstrated the selective grazing ability of cattle and the dexterity with which they eat grass from around longleaf and slash pine seedlings without disturbing the young trees. Cattle admittedly browse on seedlings and sprouts of valuable hardwoods in the Mississippi Delta and other bottomlands. A study of sheep grazing on the Desoto National Forest in southern Mississippi, revealed serious damage particularly from eating out the buds of longleaf and slash pine seedlings, but mainly during the winter and early spring when there was little other green vegetation. Who knows but that future research may work out improved methods of grazing both pine and hardwood types with cattle, sheep and perhaps even goats that will be entirely compatible with good forest management, just as has been done frequently on the western range?

Progressive forest landowners for decades have been interested in cattle as a means of consuming much of the "rough" and reducing the fire hazard. Foresters report that fires in grazed areas do not burn with as much intensity and are easier to fight than on ungrazed ranges. The consensus of interviews with more than 300 farmers in the Coastal Plain of North Carolina, Georgia and Louisiana shows that the grazing of cattle on forest range reduced the fire hazard from twenty-five to fifty percent. Reduction takes place through actual eating and trampling of potential grass fuel, and by impelling a change to a less combustible plant type.

The McNeill, Mississippi, study of the Southern Forest Experiment Station has demonstrated that close grazing kills out coarse wiregrasses and encourages the spread of plants with less hazard, such as carpet grass.

Farmers frequently report that young pines grow faster on grazed than on ungrazed forest areas. Grazing appears to be a successful way of reducing grass competition and leaving nutrients, moisture and sunlight for the seedlings. Excessive trampling, of course, especially in small farm woodlots, may greatly retard the growth of young pines.

In contrast to the adverse reaction to indiscriminate burning, stockmen and many foresters alike have come to the practice of carefully prescribed burning in the longleaf type to reduce the "rough" and remove excess fire hazard as well as to improve the grazing. In a cooperative study at Tifton, Georgia, the forage on burned wiregrass range made

earlier growth, was more nutritious and palatable, the yield was slightly higher, and cattle made better gains than on unburned range.

On the other hand, research in the reed forage type in North Carolina is indicating that fire can be of no particular use as far as grazing is concerned. The grazing capacity is reduced and the season for grazing shortened.

The Coastal Plain forest range offers such a cheap source of forage as to warrant careful evaluation of the season when the various types have their highest grazing values. The season when the range can furnish satisfactory nutrition is a guide to the development of more costly improved pastures and feed crops for carrying the cattle in good productive condition through the rest of the year. The problem is complicated, however, by the many types of forage and the literally hundreds of plant species with some grazing value. Studies to date indicate that cattle will usually do well on the wiregrass or three-awn type in spring and early summer when it is green, but they merely maintain body weight in the fall after the plants have grown up coarse and tough. In the winter grazing on this type, without concentrated supplements, results in high starvation losses and low calf crops.

Areas supporting broomsedges or bluestems and carpet grass, in addition to wiregrass, can be used in spring, summer and early fall. Other types, particularly in marshes and the Mississippi Delta, are best for winter, while still others with a good variety of sandy ridges, bottomlands and swamps may be grazed practically all year if supplemented for a short winter period with concentrated feeds.

Chemical analyses show the native forage in nearly every state from North Carolina to Texas to be deficient in certain essential nutrients during most of the year. Protein, phosphorus, calcium and other essential minerals are inadequate to maintain even dry cows, and are far below that needed by cows nursing calves, and by growing animals.

Based on research already done, it appears that minerals and concentrated protein feeds as supplements to the range should go far to attain better forage utilization, reduce death losses, increase the calf crop, the weight, condition and market value of calves at selling time, and step up the rate of growth and development in young animals. Costs would be far less than the increased returns. Cattle on typical flatwoods, for example, fed a supplement of two pounds of cottonseed meal a day from October 15 to December 10, gained an average of twenty-four pounds a head.

In contrast, animals on similar range but without protein supplements, averaged a loss of forty-four pounds a head, a net difference of sixty-eight pounds.

Good forest management makes more problems for the grazer. Ample palatable grasses will grow on clearcut or partially restocked land, but profitable grazing management under a fully stocked forest is quite a different matter. This is due to the gradual diminution in the amount and perhaps quality of forage resulting from shading out by trees. Farmers in the Louisiana forest grazing survey estimated an average reduction of two and a half percent a year in grazing capacity as the canopy of a fully stocked stand closed over. However, there will always be openings in any well-managed forest, occurring both naturally and through cuttings. Also wide fire lanes, perhaps seeded to improved pasture grasses, will furnish a continuous base on which to carry a permanent herd.

The growing of pedigreed beef animals in the South, mainly on farms, is constantly expanding. The greatest stimulus in bringing this about was the eradication of the cattle fever tick. This has made possible the successful use of purebred bulls on forest range with an immediate benefit in number, size and quality of the calves. However, undernourished calves and yearlings on forest range still take on age without maturing all of their inherent b e e f - making characteristics. Moreover, such animals appear even more susceptible to disease and death than the native scrub stock which through 150 years has built up blood lines well adapted to survive in the struggle with hot, humid weather, ticks, lice and prolonged seasons of below-maintenace diet. Practical cattlemen are building good range herds by adding the better beef blood to their native stock.

The infusion of better blood into cattle herds on the southern forest range has caused owners to give the animals more feed and care in order to protect their investment. This means in general grazing the forest range for a shorter period, ordinarily from April to October; or with use of supplements, for a longer fall period. It means a great increase in improved pastures, hay and small grains. Shifts to more pastures and forage production would bring desirable diversifications in farming and greater returns from cultivated crops, livestock and trees.

As to the future, there is room for further expansion in livestock numbers—just as rapidly as farm production can provide sufficient fall and winter feed. Southern forest ranges are still stocked far below capacity for the season

when forage is best—spring and summer. Yet the greatest opportunity for expanded production lies in growing more beef cattle now on farms and in the forest—a calf every year instead of biennially, 400-pound calves at eight months instead of 300-pound yearlings, and negligible death losses.

The South needs better range management. This will be brought about by establishing and reproducing better forage species, by adapting kinds and classes of animals to different types of forest range; by working out more definite seasons of forest grazing for the many different types to obtain maximum nutritional values; by arranging better distribution of animals over the range through well-placed fences, salt grounds and water developments; by grazing proper numbers of animals on the range to make full use of the forage without damage to tree seedlings and soil values.

In livestock management, the future will see more suitable animal breeds and strains developed for hot weather and low seasonal nutrition, and improvement in feeding methods. There will be more workable coordination with forest management — adapting grazing methods on cutover and restocking our planted lands, as well as on fully stocked selectively cut stands, to maintain both cattle and trees; solving the grazing-burning-fire hazard problem; finding fire lane treatments such as seeding, fertilizing, grazing and mowing; determining seasons and intensities of grazing to avoid serious damage to pine and hardwood reproduction; and fitting grazing into the rapidly expanding tree farm movement.

Taking Our Soils For Granted

Condensed from PhilFarmer

Wm. A. Albrecht

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BECAUSE soils seem to be everywhere and because plants with their roots in the earth are all about us, we take soils and crops on them all for granted. But now that there is no more "new land" available, and when food shortages with rationing and victory gardening are bringing many of us "back to the soil," we are beginning to see that we cannot continue to take our soils for granted.

Man, at the top of the pyramid of all the different life forms, has the help of many of these in reaching out over extensive areas of soil to collect his essential food elements and food compounds. There are some dozen different chemical elements coming directly from the soil. Man himself travels far to eat the fruits of many different soils. Then, too, he is omnivorous, that is, he eats almost everything including vegetable, animal, and even mineral, to increase the possibilities of giving to his body each of the dozen essential elements found in the soil. Plants send their roots searching through the soils as they do their collecting and fabricating of man's foods. Animals search through the plants to collect and construct still further for him. He selects from all these foods—both plants and animals —the bulk and concentrates he needs for energy, for growth, reproduction, and other complicated body performances. All of these performances and body processes are too often taken for granted and there is no recognition of the soil as a helper or a hinderer. Though we have seemingly been far removed from the soil, nevertheless, the changing conditions in economics, in agricultural production, in the capacity of our soils to provide essentials, and in the nutritive quality of our foods are all bringing us to think more about the soil.

If we should follow the suggestions of one of the American poets who said, "go forth unto the open sky and list to Nature's teachings," we can see that the wild animals — quite different from man — do not take their soils for granted. The bison or buffalo was a critical examiner of

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his feed according to the soil growing it. In fact, he gave his name to "buffalo grass," the particular grass which the pioneers listed as his choice. Buffalo grass and the range of the buffalo did not extend very widely. The densest population of these brawny animals covered a limited climatic area of small extent from East to West though much more extensive from North to South.

The buffalo was native to a soil belt formed so as to deliver its fertility elements in the vegetation according to a specific climatic area that gave specific soils accordingly. These particular soils limited the territory over which the buffalo roamed. The climate as it left more lime and other chemical nutrients in the surface soil near the zone of grass root contact—not as it was wet or dry and cold or warm—controlled the buffalo range. Coincidentally, it is on these mineral-rich, less-leached soils under lower rainfall, or on these original buffalo soils, where our hard wheat of high protein and high mineral content grows today. It is also on these soils that cattle in large numbers literally raise themselves and the Herefords have made their reputation. It is these soils that produce, not tons per acre of woody vegetation, but short grass of extremely high nutritive quality.

The buffalo had sense enough to stay on his particular soils. He wasn't lured eastward to soils leached by higher rainfall nor to bluestem, bunch grass and other native vegetations yielding much higher tonnages per acre. There were no mountains, big rivers, or other land items to obstruct his travel eastward toward more woody vegetation. As a strictly herbivorous feeder, his sense of better feed from more fertile soil kept him on the "buffalo grass" area and thereby on the soil quality that through this plant made him brawny, big of bone, and consequently the King of the Plains. The buffalo knew his soils. He did not take them for granted.

Because we have been taking our soils for granted, there are many instances to demonstrate that the soils have been going down in their fertility stores while we have thought they are as good as when our fathers or grandfathers farmed them. Some illustrations from Missouri's many experienced cattle breeders may well serve. A distinguished Hereford breeder, only recently deceased, accumulated a wealth of knowledge and sales experience with his choice breed during fifty years on the prairie soils of northeast Missouri. But to his disappointment in his later years he discovered that he had been oblivious to the fact that the soil of his extensive pastures had been going downward in the supplies of minerals for service in giving

the former quality of feed. His calf crops were too low because the females were not reproducing regularly, regardless of attempts to provide better bulls. Shy breeders were becoming more numerous. Good females were dropping out too early in their breeding life. Some with the best pedigrees were calving only in alternate years, and calves were coming at most any time instead of as one crop in the spring season as Nature has most young animals come. Heifers were not the desirable thrifty animals, but of rounded backlines, tender pasterns, drooping heads, dull eyes, and other indications of low thrift even on pastures apparently lush in terms of abundant herbage.

On this farm the humus of the soil is no longer what it was fifty years ago when the breeding business in Herefords was coming up so well. The soil has weakened as the foundation on which both the breed and the breeder originally rose. It has grown old faster than the owner because it has given much of itself to the business but gotten none of the limestone, phosphate, green manures, and other fertilizer it should have had in return. It has been taken for granted too long. Now as it is passed on to the children—like so much other land—they may well say, "Yes, here is the farm, but what about the soil?"

Fortunately, this question has been answered by another and younger Hereford breeder who is succeeding today on the same soil type and using foundation stock purchased from the older breeder. Their continued progress beyond the half century is assured because this newer herd is under a breeder-farmer who will not take his soil for granted. Though much of the original surface soil on his farm had eroded away before he became possessor, he is rejuvenating the clay-points of subsoil and restoring the soil fertility on his farm by means of phosphates, limestone, and any possible fertilizers that will help to make sod crops, to provide green manures, and to give fertility features as supplements to contour cultivation on the dangerous slopes.

His herd of cattle, though started originally as a remnant of a declining one, is giving calf crops of almost 100 per cent. The calves all come within a limited period in the spring. The farm is producing not only ample supply but also high quality feed. While the soil under this rebuilding process has gone up to an alfalfa level, the Hereford herd too has gone up to the blue ribbon level in the eyes of those who know cattle. It is this breeder's belief that attention to his soil fertility reduces the attention needed by the cattle. "No," he will say, "we cannot take our soils for granted when they and their

fertility are so basic to a type of agriculture that depends in a large measure on livestock."

Our human foods, too, have been taken for granted. We have measured them in terms of bulk, rather than in terms of quality grown into them by the soil. Processing foods has taken out much that the soil and Nature's fabrication processes have put into them. Milk is measured by the volume or by the fat content—the former a measure of bulk and the latter mainly of fuel value. Its measure in terms of growth quality for the young cannot be recorded by these criteria. It must be scaled in terms of the soil that transmitted to the cow through plant growth the means whereby she could put in the life-multiplying qualities for her offspring and her human foster family. The "town without a toothache" has suddenly become news, apparently because we had previously taken our soils for granted and forgotten them as the basis of our health. Correspondingly we had accepted bad teeth as though they were natural. Since bad teeth are but an exposed part of a bad skeleton we need to take seriously this demonstration that we also have been taking our bone troubles for granted. We have failed to give attention to the soils from which must come the calcium and the phosphorus needed to construct sound bones and good teeth. Likewise, we forget that it is by means of the soil fertility that Nature must construct the vitamins and other catalytic agencies that facilitate body growth processes from the food substances we consume. Human health, too, depends on the soil, which, common as it can be everywhere, is seemingly still too far removed from us to be so connected in our thinking.

Fertile virgin soils, plenty of lands, and an abundance of humus and of other fertility compounds in them were naturally an inducement to our mental lassitude, to indifference to erosion of the body of the soil, and to exploitation of its stores of humus and fertility. But then the numbers of draftee rejections are so high in some soil areas, the national health pattern is beginning to delineate itself according to the soil's pattern of essentials for nourishing both beast and man. Soil conservation is now taking a national inventory of the disappearing hidden qualities by which soils sustain domestic animal life at profitable economic levels and human life at high planes of good health and therefore of efficient citizenry. Our own future—but more particularly our place in the international future, points out forcefully that when our national health as well as our national wealth lie in our lands we cannot take our soils for granted.

Income Tax Rates and Farm Investments

Condensed from Guernsey Breeders' Journal

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EFFECTS of existing income tax rates and regulations on investors in farm real estate, pure bred live stock, and other farm capital vary according to size of income. Those with small incomes are permitted to retain a higher proportion of current income and capital gains than those with large incomes, while those with large incomes are able to recover a higher proportion of major capital losses and depreciation. These widely varying economic effects have an important bearing upon the competitive position of investors in farm capital.

Table 1 illustrates this for individuals at three widely varying income levels. It is assumed that A has a small income all from the farm operated by himself; B has a medium income largely from other sources than the farm; while C has a large income to which his farm contributes a very minor part. Each is assumed to be married and to have two dependents.

A is permitted to retain 88 per cent of the taxable income from his normal farm operations, while B is permitted to retain 56 per cent of his farm and non-farm taxable income, and C only 19 per cent (Table 1). The larger the income the higher the proportion of normal taxable income required to pay income and victory taxes.

All capital gains arising out of the sale of farm real estate are subject to tax graduated according to income if sold six months or less after purchase; but if not sold until after the six-month period has elapsed, the seller is permitted to retain 50 per cent of the profit tax-free regardless of size of income. The remaining 50 per cent is subject to tax or to the alternative tax regulation. If the farms owned by A, B, and C are sold at $16,000 profit each within six months after purchase, A is permitted to retain 60 per cent of the gross capital gain, B 32 per cent, and C only 11 per cent. But if not sold until after the six-month period has elapsed, A retains 80 per cent of the resale profit, B 68 per cent, and C 68 per cent. Thus, those with small

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incomes retain a much higher proportion of resale profits than those with large incomes, but the relative difference is less for long-time than for short-time gains.

On the other hand, if the farms owned by A, B, and C are sold at a loss of $16,000 each, and if the resulting reduction in tax is credited to the capital loss, A covers only 12 per cent of the loss through decreased income and victory taxes, B 60 per cent, and C 94 per cent. The actual loss is almost complete for A, but decreases with rising income until it becomes relatively unimportant for C.

Similar effects arise from investments in pure bred live stock, and the period of depreciation for income tax purposes is 10 years, A will recover 24 per cent of the original cost during the 10-year period, B 65 per cent, and C 93 per cent. Thus, the price paid for the animals is a matter of less concern for those with large than for those with small incomes.

The same general principles apply with respect to investments in other types of depreciable farm capital, such as grade breeding stock, commercial dairy cows, farm buildings, and machinery. Those with large incomes can invest in such items with less regard to the original cost than those with small incomes. A serious decline in sale prices would have little effect on those with large incomes, but would be disastrous for those with small incomes operating largely on borrowed capital.

It is apparent that, under existing regulations, investments in farm real estate serve as a partial protection against inflation for buyers at all income levels providing sale values rise further after purchase and either remain at a higher level or the farms are sold before the boom breaks and full payment received. The protection is more complete for those with small than for those with large incomes. On the other hand, those with large incomes are assured of a relatively small loss on the investment if land values drop, as long as the gross loss from the sale of the farm is small compared with total taxable income. As the level of income declines, the amount of the loss increases until it becomes almost complete for the average farmer or others with relatively small incomes. Consequently, the purchase of farms at inflated prices may not prove disadvantageous to those with large incomes either in the short or long run, but it is likely to prove disastrous to those who make small down payments and expect to pay the balance out of future farm earnings.

The purchase of farms by outside investors is of interest for two reasons. In the first place, it contributes to the land boom

which is now under way in many parts of the country. In the second place, the purchase of farms by nonfarmers is likely to result in an increase in the proportion of farms operated by tenants or with hired labor.

Regardless of the relative efficiency of owner-operated and tenant-operated farms and regardless of relative security of tenure, past public policy suggests that the acquisition of large acreages of farm land during the war and early post-war period by outside investors may not meet with general approval. Many tenants look forward to buying farms, and there is likely to be considerable demand for farms by those in the armed services and by others who have left farms temporarily to work in war plants.

In like manner, the purchase of pure bred live stock by large income receivers contributes to the pure bred live stock boom which is now under way. Even though they limit their selections to animals that stand in highest repute among members of the fraternity, the result is higher prices all along the line. Those with low incomes may purchase a few superior animals in competition with their more favorably situated brothers, but, on the whole, they will be obliged to limit their purchases to animals that are assumed to be somewhat less meritorious. As they listen to the chant of the auctioneer, they must keep constantly in mind the fact that the real cost of a high-priced pure bred animal will be much less for those with large than for those with small incomes.

In some respects, a pure bred cattle boom is less serious than a land boom. Boom prices for a few animals usually represent a smaller total investment than boom price for a farm. A cattle boom is liquidated rather promptly, while the effects of a land boom may carry over the greater part of a generation. However, both are highly undesirable, and when one is superimposed upon the other, the results are bound to be disastrous for many.

Existing tax regulations tend to encourage some persons with large incomes not only to invest in farm real estate, pure bred live stock, and other forms of farm capital, but to make expenditures which otherwise would not be incurred because of the relatively small equities they have in their taxable incomes. This raises a question whether society will be best served in the long run under the existing arrangements or whether some modifications are called for. If it is decided that the general welfare will be best served by discouraging investments in farm capital by those with large in-

comes and by discouraging speculation in farm properties by others, attention will need to be focused upon ways and means of reaching these objectives. One possible approach would be to prohibit the deduction of capital losses and depreciation of farm capital from farm and non-farm income combined before computing the tax. Elimination of the regulation whereby 50 per cent or more of the capital gains is exempt from tax if the sale takes place more than six months after purchase also would contribute to this end. To remove the inflationary pressure on land values by those with small incomes it may be desirable to adopt a stiff capital gains tax until after the emergency has passed.

Table 1.

Some Effects of Graduated Tax Rates on Minnesota Farm Investments by Individuals at Various Income Levels*

	Size of Income		
	A Small	B Medium	C Large
Nonfarm taxable income	$0,000	$30,000	$300,000
Returns to farm capital and management	3,000	3,000	3,000
Gross income tax income	4,000†	33,000	303,000
Gross victory tax income	4,030‡	33,000	303,000
Total income and victory taxes on normal income	482	14,424	246,485
Per cent of income tax income remaining after payment of normal income and victory taxes	88	56	19
Per cent of capital gain retained if farm is sold for gain of $16,000:			
Six months or less after purchase	60	32	11
More than six months after purchase	80	68	68
Per cent of capital loss recovered through reduction in tax if farm is sold for loss of $16,000	12	60	94
Per cent of $10,000 invested in pure bred live stock recovered through depreciation	24	65	93

*Data are based on tax rates in effect December 31, 1943.

†Includes $3,000 return to capital and management, $900 for the operator's labor, and $100 for the depreciation and upkeep of dwelling.

‡The victory tax for A is increased by the real estate tax on the dwelling, which is estimated at $30.

Fitting Sheep for Sales

Condensed from The Eastern Breeder

George W. Litton

Animal Husbandman, Virginia Polytechnic Institute

FIVE dollars per bushel for oats is a handsome price, especially if you're selling. A purebred sheep auction is the place grain sells at that premium regardless of the arguments pro or con. Doesn't it seem as though something is disrupting the powers of reason when buyers demand (because they pay well for it) plenty of finish on sheep, which is of no use to them? It costs money to put fat on, doesn't do the sheep's digestive system any good, must be taken right off again for practical purposes, yet the man with sheep for sale can market his grain higher through his sale sheep than most any other way. There is no use saying "don't do it" when it will make money, so since it is going to be done, let's do it wisely.

Breeders in Virginia produce close to 500 yearling rams of the leading mutton breeds for sale each year. They sell 50 per cent of these rams through eight sales organized for that purpose. Approximately 2,000 persons attend these sales, which gives sheepmen the opportunity of making 2,000 impressions favorable to the business of producing lamb and wool.

The thing that actually happens is that there is always some breeder who goes down to the back pasture and scares his rams out of the brush, loads them on a "pick-up" and heads out for the purebred sale. He stamps, yells, and pitches sawdust about his consignment not being pampered, but his plea falls on deaf ears because the buyers take his sheep at about $15 per head reduction in price. Such a breeder is a good advertisement for the other man's business, not his own. One thing is to be said in the favor of sheep so handled though, and that is the heat doesn't bother them, and they'll improve in looks under almost any system of management they are subjected to. However, the point is, we Americans won't buy unless the article has buy-appeal. Theoretically we are supposed to know and appreciate sheep even in the rough, yet we find ourselves leaning way over towards the one with the fleece cleaned and trimmed and in quite

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good sale flesh. We fall for the ones that look the best. Sales should be treated as the show window of the sheep business. It is just like an up-to-date shop which keeps its windows well dressed and neat. Well arranged displays have the effect of being hypnotic; they draw, attract, or delight. And when one is attracted and delighted at the same time, the pocketbook strings begin to loosen.

For ram sales held in July, we like to have the rams clipped by April 1. And by clipped we mean sheared to the skin with machine shears — hand shears and other forms of stubble clipping are frowned upon by the Purebred Sheep Breeders' Association which sponsors the sales. The fleeces should be clean. This cleaning is done in a variety of ways. Perhaps the ideal way is to keep them clean from the time of clipping until the sale and then no washing is necessary. Since most fleeces do collect dirt before sale time some cleaning is usually in order. A few breeders turn the hose on and apply soap and a scrub brush. No doubt about this method of getting them clean. It has the disadvantage of washing out all the natural wool fats and skin oils and presents the fleece in a harsh, unnatural condition. The best washing is done with no soap at all, and with just enough water to wet the fleece as far down as the dirt goes. Rub the fleece dry with a woolen or flannel cloth and the dirt is gone but most of the natural softening wool fat is left. The addition of a little soap speeds the job up if time is a great factor, but it may clean so thoroughly as to give the artificial look we try to avoid. Trimming or blocking the fleece is necessary. Men who've been in the business the longest insist that blocking must be done, and we hear values as high as $5 per head attributed to the blocking. A fairly decent job can be done in two hours, which pays for labor at $2.50 per hour. And any man in the United States today who earns $2.50 per hour had to spend a little time in training either in school or as an apprentice. A shepherd need not be discouraged therefore, if he does have to spend a few days in learning a trade that brings $2.50 per hour.

As for the flesh sale sheep should carry, it would seem that parasite free sheep in the cooler, better grass counties of the state will get sufficiently fat off grass for efficient commercial lamb production—and for the good of the sheep that fleshing should be enough—yet, as stated before, a man with sheep to sell can use grain to put extra flesh on and get well paid for the grain. As long as this situation persists, a lot of grain will be marketed through sheep. To do the sheep the least

harm, use only small amounts of corn in hot weather. Let the grains be bulky and less heat producing, such as oats, bran, beet pulp, etc. Use plenty of roots such as beets, turnip and rutabagas or cabbage. Allow them to graze at night but to be in a cool clean shed or barn out of the sun and flies during the day. Never let the fleeces get rained on because this takes the bloom out and lowers the attractiveness on sale day.

This year, in December, for the first time in the history of the Sheep Association, its members are holding a bred ewe sale. To get ewes ready for that sale means that they should be bred early so that they will be showing up in lamb by December. To get them settled early means that they must be kept parasite free and be coming up in flesh by August 1. After they are safely settled they should have excellent grass to keep them coming along until say November 1, when they should be getting a little grain and some attention to the fleece. To make this first sale a success, it will be necessary to bring them out looking their best.

Before sheep can be entered in the consignment sales sponsored by the Purebred Sheep Breeders' Association, the consignor must be a member of the Association. This is accomplished by making application to the secretary in writing, and by payment of dues of ten cents per head on each producing ewe in the flock. The sales committee then inspects sheep for sale and as many as are acceptable are listed, and when allotments are given to the various sales part or all of these accepted sheep may be entered, depending on the supplies of rams available for sale. Just because they are accepted doesn't guarantee that all will be handled by the sales committee. All sheep entered must be yearlings—and all are guaranteed breeders if properly handled.

Pole Thinning of Peaches

Condensed from The Eastern Fruit Grower

Dr. John C. Snyder
State College of Washington, Pullman

IN the early days of peach growing it was believed necessary to space the fruits at definite spacings from 4 to 8 inches apart, depending somewhat upon the vigor of the trees —the greater the vigor the shorter the spacing.

Reprinted by permission from The Eastern Fruit Grower

It has recently been found that spacing is not as important as we formerly believed. It is considered more important to leave the desired total number of fruits on the tree than to space those which are left according to any specified distance.

To minimize the labor, various methods of thinning and devices have been tried. One that offers considerable promise to growers with Elberta variety and its strains is what is called the "Pole Method of Thinning."

With this method, Cecil C. Clark of Wapato, Washington, reduced his thinning bill of this variety to about one-eighth. Other growers are finding this method a time saver.

The only equipment necessary is a long pole, 10 to 14 feet long, depending upon the height of the trees to be thinned. The pole must be strong, supple and light.

The pole is rounded with the diameter at the base about 2 inches and that at the top about 1 inch. The region of small diameter should be 2 to 3 feet from the tip rather than at the tip, so that the spring action is in the upper 4 or 5 feet of the pole rather than throughout its length.

Pole thinning must be done during the "June drop." If done earlier or later it is too difficult to get the fruits off and to do it uniformly. This is slightly earlier than mid-season and late varieties are usually thinned.

The operator with the base of the pole grasped firmly, strikes directly into clumps of fruit or against the side of small branches needing thinning, exerting light, sharp taps. He need not be afraid of injuring the fruit.

Experienced operators have no difficulty in leaving the right amount of fruit on the tree. As with other methods, beginners will do well to start in gradually, checking the spacing of the fruit as each tree is completed, until they acquire the skill of leaving the right amount. An experienced pole thinner can thin approximately 10 times faster with a pole than by hand.

Comparisons of ripened fruit have shown no injury from pole thinning.

The Caley Pea—A Sensation in the Deep South

Condensed from Seed World

Harold Severson

DOWN in the Black Belt of Alabama, that 170-mile long strip of pasture land stretching across the central part of the state, there's a fascinating story of a country that staged its comeback through the aid of one man, an "outlaw" grass and a neglected pea.

The Black Belt was once a great cotton producing area. For more than a century, bumper loads of cotton rolled up to gins at Selma, Demopolis, Camden, Epes, and Montgomery. Huge fortunes were made by large scale planters. Cotton grew luxuriantly on the waxy black topsoil which gave the Black Belt its name. But Johnson grass also grew luxuriantly, which meant that thousands of field hands had to chop out grass from the cotton rows from morning until night.

Then in 1914, disaster struck in the form of boll weevil. Cotton yields slumped to the point where it was no longer feasible to chop out grass and raise a money-making crop. In the meantime, the best of the fertile soil had been washing away as a result of the clean cultivation necessary for cotton, and Johnson grass kept gaining more and more headway. Hundreds of farmers threw up their hands, quit farming, and migrated to different sections.

Not all the planters quit, however. Some of them tried to make a go of beef and dairy cattle in this erstwhile cotton country. "Why not make a commercial hay crop out of this cussed Johnson grass?" asked some of the more enterprising growers. Johnson grass did become a great hay crop, with thousands of carloads moving out of the Black Belt during the first World War. Then machinery was substituted for mule-power, and demand for Johnson grass hay fell off.

In 1931, things were at their worst in the Black Belt. More than 50,000 people left its rural areas.

But 1931 also saw a new day dawning for the Black Belt. That was the year K. G. Baker, a Kansas-educated Texan, came to Marion Junction and established

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the Black Belt Experiment Station. Mr. Baker saw the possibilities of the Black Belt as a cattle producing section. Here was year-round grazing, favorable climate, and plenty of rainfall. But something was missing. Clovers did not grow luxuriantly. Soil analysis tests showed a sufficiency of phosphate, but plants exhibited every sign of phosphate starvation. That was the limiting factor, and it was up to Baker to find the solution.

He did find the answer to the riddle. His experiments showed that the phosphate in the Black Belt soil was locked up in a compound that kept plants from utilizing it. Consequently, heavy applications of superphosphate would remedy that deficiency. Thick, heavy stands of legumes, such as White and Persian clover, black medic, dallis grass and others began to make their appearance. Cattle could grow on this type of pasturage.

Next Baker turned his attention to Johnson grass, that hated and despised pest of the cotton fields. Johnson grass had certain good qualities, however. Baker put it to work in the pastures and today it fits into pasture management plans perfectly. There are two periods in the Black Belt when grazing falls off—from May until July, when black medic and white clovers have matured, seeded, and died out—and when the killing frosts hit late in the year. Johnson grass is good to the last nibble. Even when frosted, it is consumed with relish by the cattle, who eat it down to the ground.

But the plant that has won a place for itself in the affection of Black Belt cattlemen is the Caley pea. That plant has more than one name. In other parts of Alabama it's called the Wild Winter pea, and Louisiana farmers and seedsmen call it the Singletary pea after B. H. Singletary, head of the horticultural department of Louisiana Experiment Station. But it's the Caley pea to Black Belt farmers, because its possibilities were first noted by A. F. Caley, a transplanted Ohio farmer whose dairy farm adjoins the Black Belt station.

"The Caley pea bids fair to revolutionize agriculture in the Black Belt," asserts Dean M. J. Funchess, of the Alabama Experiment Station. Cattlemen agree with him.

For years it was just a forgotten plant growing in fence corners. Then Caley began studying it and began to feed it to his cattle. The more he worked with it, the better he liked it. Then he suggested that Baker study it more thoroughly. Baker really exploited the pea, which has a close resemblance to the sweet pea.

"It's invaluable for supple-

mentary grazing in late winter and early spring," he says. "Furthermore it can be used for silage and hay. Being a legume, it improves the soil."

One of this legume's advantages is that it furnishes more grazing during the winter. It reseeds itself each year in June and comes up voluntarily the following fall. It therefore grows in perfect rotation with either Johnson grass or paspalum and thus two volunteer crops are produced on the same land annually without seeding or cultivation costs. There's a possibility that Caley peas may supplant the legumes now grown in rotation with Johnson grass.

The pea is fairly resistant to drouth and to excessive cold weather. It should be planted on hay fields, according to Baker, as it will produce a legume hay and then stimulate the succeeding Johnson grass tremendously. The plant is a prolific seeder and good stands should produce 600 pounds of seed per acre.

Scattered plantings have been made outside the Black Belt. Some succeeded and many have failed. The failures are said by J. C. Lowery, Alabama extension agronomist, to be due to using Caley peas only in the same manner as Austrian peas.

The striking results which Mr. Baker obtained by grazing beef cattle on Caley peas on his Black Belt sub-station has quickened the interest of livestock men. You hear about Caley peas everywhere—walking on the streets in Selma, inspecting a Marion Junction pasture, talking livestock with a Demopolis banker. This crop is so promising that nearby localities are giving it a trial.

The only drawback noted thus far is that Caley peas are toxic to animals when the plants are beginning to bloom and make seed. For that reason, the peas should be planted on areas where grazing can be controlled when blooming starts. Caley peas should not be considered a substitute for permanent pasture, according to Mr. Baker, but as a means of supplementing the permanent pastures.

Caley peas must be inoculated, vetch inoculation being recommended.

According to Black Belt farmers, there are many areas outside of the Black Belt which are heavily infested with Johnson grass and on which the Caley pea might fit in as in the Black Belt.

"Caley pea is a plant that will make Johnson Grass an important crop on the farm instead of a pest," Baker comments.

And the success which has greeted Black Belt farmers shows that it can be done.

Grazing on the fine pastures of White Dutch clover, black medic, Caley pea, Johnson and Dallis

grasses, the Black Belt herds are growing in number and quality. In 1943, the stockyards at Selma handled more than 2 million dollars worth of livestock. The fall sales of feeder cattle at Montgomery, Epes, Union Springs, Selma, Demopolis, Camden and Fort Deposit found a total of 5,525 calves selling for more than $257,000 in 1943.

Once the paradise of the cotton planter, the Black Belt has discovered for itself a new destiny as the home of great herds and flocks. The natural clovers, Johnson grass, Dallis grass and Bermuda, supplemented by the Caley pea for winter grazing, make a pasture combination unequalled anywhere in America.

"Supercharged" Dairy Calves

Extra vitamins in the feed mean bigger and healthier dairy calves, according to dairymen at Pennsylvania State College.

Calves fed excessive amounts of vitamins A and D were checked against a similar group fed a calf starter of standard vitamin content. The "supercharged" calves averaged 17.4 pounds heavier at the end of the year, and were troubled less with scours and other calfhood ills.

Even after a summer on pasture, the calves receiving the extra vitamins were larger, had sleeker coats of hair, and carried more flesh than the other group.

—*Farm Journal*

Lime Those Poultry Droppings

Condensed from New Jersey Farm and Garden

Leslie M. Black

THE application of lime to poultry droppings or other manure has always been considered bad practice, since it was supposed to hasten the rate at which the nitrogen in the manure disappeared. Recent research work under the direction of Dr. Firman E. Bear, soil chemist at the New Jersey Experiment Station, reveals that actually the reverse is true and lime takes on added importance in the contributions it can make to the sanitary management of a poultry farm. In a forthcoming bulletin, entitled "Poultry Manure—Its Preservation, Deodorization and Disinfection," Dr. Bear describes in detail the investigations that led to some rather startling conclusions that appear quite contradictory to old ideas of long standing.

The high points of the research and the deductions that follow are well described by the authors in the summary that appears at the close of their manuscript. In their own words, the following facts are revealed:

"It was calculated that eighty-one per cent of the nitrogen, eighty-eight per cent of the phosphoric acid and ninety-five per cent of the potash fed to the hen are excreted in the manure.

"A hen consuming seventy-five pounds of feed per year may be expected to produce 144 pounds of manure in the same period.

"Fresh poultry manure produced by laying hens was found to contain nearly seventy-eight per cent moisture, 1.05 per cent nitrogen, 0.82 per cent phosphoric acid, and 0.51 per cent potash.

"Untreated poultry manure lost a large percentage of its nitrogen as ammonia, especially in warm weather.

"Superphosphate was the most effective agent used in preventing the loss of nitrogen from poultry manure. Its rate of application should be at least 100 pounds per ton of fresh manure.

"Hydrated lime was the most effective in deodorizing poultry manure. It also had a marked effect in reducing nitrogen losses from fresh manure, and in improving the handling qualities of the product. It should be applied at the rate of from 100 to 200 pounds per ton of manure, the

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100-pound rate being adequate if the lime is thoroughly mixed with the manure. The 200-pound rate may be necessary if the lime is merely scattered over the droppings daily.

"Hydrated lime was found to have a bactericidal effect on pullorum, typhoid, paratyphoid, and fowl cholera organisms and to prevent sporulation of coccidial oocysts and segmentation and embryonation of Ascaris lineata eggs."

Every poultryman realizes the menace that accompanies the accumulation of droppings on a poultry plant. Aside from the obnoxious odors that are generated, they act as a constant threat to the continued health of one's own birds and those on neighboring plants. The collection of droppings in pits attracts and breeds flies, offers an ideal harboring place for mice and rats, while the insects and rodents serve as active or passive carriers in the transmission of disease or parasitic infestations. Moreover, decomposition takes place, robbing the manure of its highly desirable nitrogen content. The same disadvantages exist and are accelerated when the droppings are collected regularly and removed to piles outside of the poultry houses even though the piles are protected by cover.

The addition of hydrated lime in the recommended amounts can largely eliminate these objectionable features. The lime might be spread on the dropping boards following their regular cleaning or scattered over the collecting material in the dropping pits. A further interesting finding of the study was that rodents appeared to avoid dropping piles to which lime had been added. The addition of the lime would not only enhance the manure from a fertilization standpoint, but would also provide a means of maintaining the proper degree of alkalinity in the soil on which the limed manure was used. Thus, it appears that hydrated lime may be destined to become an important factor in poultry plant sanitation as a result of its preserving, deodorizing and disinfecting properties, in addition to its already well-recognized value as a soil improver.

Electricity Unloads the Corn Wagon

Condensed from Electricity on the Farm

Virgil Marvin

Farm Engineer, Toledo Edison Co., Wauseon, Ohio

ED Forest is a good farmer . . . and a good American. He recognizes the fact that the farmer's Wartime job is to produce more food—lack of new equipment and farm help shortage notwithstanding.

Mr. Forest operates 60 acres in Fulton County, in northwestern Ohio, without outside help. A couple of years ago he created considerable interest by being perhaps the first farmer in this territory to construct and use the popular farm-built electrically operated ear corn and grain elevator.

And now Ed has come through with another idea to save time and get farm work done with less human effort. By employing the principle of the corn elevator, but in a different position, he developed an ingenious conveyor which greatly facilitates unloading ear corn from the wagon. He needed a new hay rack, so a conveyor was built into the center of the wagon bed floor, lengthwise of the bed and flush with the floor. Each side of the wagon bed floor slopes toward the conveyor in the center.

The conveyor trough is 7½" wide and 4" deep and carries a single chain (No. 62 link) to which is attached 1½"x7" flights spaced 20" apart. The chain travels around sprockets at each end of the trough and is powered by a 1/6 h.p. electric motor housed in a wooden box at the front end of the wagon bed. This box also serves as a seat for the driver when the wagon is in the field. The conveyor is almost identical with the chute of the ear corn elevator which Mr. Forest uses.

Before going to the field, and when using the wagon for other hauling, boards in 20 inch lengths are fitted into the trough over the conveyor to make a smooth bottom in the wagon. This keeps the corn out of the conveyor so the small motor will start it.

When a load of corn is to be taken off, the wagon is pulled alongside the crib and the motor plugged into a convenient electrical outlet. The endgate of the wagon is placed directly over the hopper of the elevator which is to elevate the corn into the crib. The conveyor motor and the elevator motor are both started and

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the first cover board removed from the rear of the conveyor. The corn is not put into the conveyor by hand, but is raked or pushed down the sloping floor with a shovel. The 20-inch cover sections are removed progressively from back to front until the wagon is unloaded.

Ed is proud of his invention, and he may well be. It shows an ability to analyze a job to be done and ingenuity enough to devise a simple and inexpensive piece of equipment to do it. It is also an excellent example of how electricity can be made to help in the better management of farm work.

This One-Horse Farm Is Paying

Condensed from The Progressive Farmer

Kenneth B. Roy
Editor, Alabama Agricultural Experiment Station

IT was back in 1940 that Pomp as a tenant was farming the place—a typical worn-out 70 acres in the Alabama Piedmont near Auburn. That year he picked four bales of cotton from seven acres, sold 1½ tons of seed, scratched over a good many acres in corn, and sold four weanling pigs and two calves to neighbors up the road.

It is all quite different now. Cal as a wage hand is farming the place under the supervision of the Alabama Experiment Station. Dollar for dollar, Cal produced nearly four times as many dollars worth of farm products last year as did Pomp in 1940—all because of making licks count.

What's more, Cal used one good mule to farm about the same acreage that Pomp worked with two. Supervising the farm's operations, the experiment station has found that jobs, which oftentimes are assumed to require extra horsepower, can be done successfully with a single work animal if ingenuity and equipment of the right kind are used.

When the station acquired the unit, the land was steep, rough, and galled. The badly located bench terraces, grown up in briers, honeysuckle, and sassafras, were broken in numerous places, with gullied, finger-like furrows stretching down across the fields. Much of the topsoil and some of the subsoil had washed away during the hundred or more years of farming by owners or tenants.

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Improvement looked downright hopeless. To increase yields, all of the land needed soil-building crops to add humus and nitrogen. Some of the land would have to be tied down with kudzu. Even the other cultivated areas were more suited to forage crops than anything else. Obviously, to shift to a forage-crop type of farming, livestock would have to be increased to turn forage into cash and a complete change of this sort would take several years. Meanwhile, enterprises were needed that would furnish an income for family living and better use Cal's time, especially during off seasons.

The first step was to add 200 chickens. Here was a crop that required very little land, turned in a daily income, used labor during slack periods, and gave large returns for Cal's time and for each pound of feed used. As the feed-producing program began to put hay and fodder in the barn and grain in the bin, two brood sows and five cows were added for marketing the added feed.

To avoid an overload of labor in the spring on one mule and one man, the job of soil building has been divided up between Austrian winter peas or vetch, and crotalaria. The crotalaria can be turned during the slack period in the winter.

Most of the land during the winter is protected by either a heavy stubble mulch or legumes or small grain. Some of the land is planted every year in corn, with crotalaria, which reseeds itself, used as a summer legume; other acreages are planted in corn every other year, followed by peanuts to be hogged off. A small acreage is planted every third year to corn in a rotation with cotton and oats followed by vetch. With vetch, crotalaria, kudzu, alfalfa, crimson clover, lespedeza, "hogged" peanuts, and cow and chicken manure, soil fertility is gradually being restored.

Oats and wheat are mowed and stored when nearly ripe, then fed in the straw to chickens and hogs. On bench terraces this system wastes less grain than a binder or a combine.

This station - managed farm is not in any sense a show place now if anyone is looking for elaborate buildings and equipment. The station began its operations just as a farmer would—with a minimum of expense — and has continued on that basis ever since. Only improvements and purchases that contributed to production of farm products for market and for farm family living have been made.

In order to make fair comparisons between the 1940 and 1943 farming, 1943 prices for the products produced by both Pomp and Cal are used here.

Cultivated acreage was about the same both years. Yet by better management leading to larger farm business, fuller use of land, better yields and year-round productive work, the farm's cash receipts were $2,022 in 1943 compared with $550 that Pomp got for his last crop. A comparison of cash receipts from the two methods of farming shows these differences on a percentage basis:

Enterprise	1940	1943
Cotton crop	82	22
Livestock (other than poultry)	11	14
AAA payments	7	4
Eggs and fryers	..	60

From the standpoint of cash labor returns, Pomp in 1940 made about $2.20 per day for the estimated 251 ten-hour days he worked; Cal in 1943 put in 339 ten-hour days and averaged nearly $6 per work day.

Nothing was produced on the farm in 1940 to yield a regular income. The farm as a managed unit produced cash every day of the year.

Pomp, in 1940, used four hours out of every ten in producing twenty-five acres of corn alone, and corn with beans or peas, but his yields were low and his hours unproductive.

Pomp got 192 bushels of corn, 1,900 bundles of fodder (five tons), 10 bushels of cowpeas, and 20 bushels of peanuts on 33 acres; last year 12½ tons oat hay, 8½ tons wheat hay, 3¼ tons alfalfa hay, 300 bushels corn, and six tons grain sorghum were produced on twenty-seven acres.

One of the significant differences in management is the distribution of labor. In its management of the place, the station has reduced the two high labor peaks typical of a cotton farm — the planting and chopping season in spring and picking in the fall. This was done by decreasing the acreage of spring-planted crops, including cotton, and by starting productive enterprises that would fill in the low periods of labor demand, such as setting kudzu, improving pastures, producing livestock and livestock products, seeding winter cover and grazing crops, and repairing or building essential equipment and fences.

In the three-year operation of the farm, this equipment was found essential: a breaking plow, a Georgia stock, homebuilt stalk-cutter, single disk, mower, rake and wagon.

This type of farming may be used by any farmer in the Piedmont or similar area who has local markets. Allowing for an average amount of tools, equipment, feed and livestock, a renter having a long-time lease, or an owner, could start such a program on about $1,200.

Three Ways to Figure Flock Averages

Condensed from Poultry Tribune

T. G. Neil

THERE are three ways of calculating the average egg production of a poultry flock. These are referred to as:

1. Hen-housed average.
2. Hen-day average.
3. Monthly average.

The success of a poultry enterprise is determined to a very great extent by the ability of the flock to produce eggs. It is extremely important that this average be calculated in the manner which gives the most accurate picture of the performance of the flock. This information is needed for determining the progress in breeding that has been made over a period of time. It also is necessary in determining the profitableness of a flock in relation to certain management practices, such as culling.

The hen-housed average is calculated by dividing the total number of eggs produced during the year by the number of layers that were housed at the beginning of the year. It is a simple problem in arithmetic. Suppose there were 200 layers housed on October 1 and they produced 32,000 eggs during the year. Some were culled during the year and 30 died, but regardless of these facts, the average is calculated as follows: 32,000 ÷ 200 = 160 eggs per bird housed.

Since the record keeping year begins October 1, as a rule, in figuring egg production averages, the question of how to handle the records of early spring-hatched or fall-hatched pullets on the hen-house basis may arise because of the fact that they may begin laying several months before or after October 1. Perhaps the best suggestion is to start counting the production of such birds when they are seven months or 210 days old and keep it for 365 days. Usually a pen is filled with birds of about the same age, so there is no particular difficulty in making the addition.

The hen-day average requires more time to calculate. It usually is figured on a monthly basis. The flock of 200 birds would have

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6,000 hen-days in a 30-day month (200 multiplied by 30). Let us suppose that one hen died on the fifth, one on the fifteenth, and two were culled on the twentieth. The deductions will be as follows:

1 died on fifth	25 hen days lost
1 died on fifteenth	15 hen days lost
2 culled on twentieth	20 hen days lost
Total	60 hen days lost

Then 6,000 — 60 = 5,940 hen days ÷ 30 = 198 average birds for month. The total egg production was 3,000, and this gives an average production determined as follows: 3,000 ÷ 198 = 15.15 eggs per bird for the month.

Monthly Average Can Mislead

The monthly average is determined by averaging the number of hens at the beginning and the end of the month as follows: 200 + 195 = 395 ÷ 2 = 197.5 average for month. The total egg production is divided by this number, 3,000 ÷ 197.5 = 15.19 eggs per bird. Adding the monthly averages gives the annual average.

While there is a slight difference in the two methods of calculating in this case, the difference might have been very different had there been a great deal of culling near the end of the month. Let us suppose that the flock had been laying well, but it was desired to raise the average by culling 50 birds on the last day of the month in addition to the other five. The calculation then would have been: 200 + 145 = 345 ÷ 2 = 172.5 average birds for month. 3,000 ÷ 172.5 = 17.45 eggs per bird.

By a program of such culling, the average egg production might be influenced to the extent of several eggs per bird in a year's time.

The Three Methods Compared

A production figure calculated on the basis of birds housed gives a more accurate picture of the productive ability of the flock as well as its livability. If the flock is one that can hold good summer and fall production without the necessity for heavy culling, it will make a favorable record with this system. Its disadvantage from the standpoint of efficient management is that in an attempt to get a high record, birds may be held in flocks longer than is economically sound.

In order of their preference, the three methods would have to be listed—1. Hen-housed; 2. Hen-day; 3. Monthly average.

As a standard or guide to follow on the hen-day or monthly average basis, here is a table used by the Connecticut Home Egg Laying Contest.

Month	Average Egg Production Pullets	Hens	Pullets and Hens
October	16	10	14
November	17	8	15
December	17	8	16
January	17	11	17
February	17	11	15
March	18	14	18
April	18	15	17
May	18	16	18
June	17	16	16
July	16	15	15
August	15	14	15
September	14	12	14
Total for Year	200	150	190

The summary of the twenty-third Connecticut Home Egg Laying Contest for the year ending September 30, 1943, showed an average production of 196.23 eggs. This was figured on the monthly average. On the hen-housed basis, the production was 153.74 eggs. The culling and mortality summary for the year showed 323 hens and pullets remaining at the end of the year out of each 1,000 housed, with 572 culled and 105 lost from mortality. In hen flocks only 170 birds per 1,000 remained at the end of the year, while in pullet flocks 345 remained. Mortality for hens and pullets was 67 and 110 per 1,000, respectively.

Phosphorus Deficiencies

Phosphorus deficiencies in cattle can be prevented or corrected if not too far advanced. Recent experiments in southern Texas have shown that beef cattle grazing on phosphorus-deficient grass can be made more productive if supplied phosphorus.

The methods found satisfactory were:

(1) Adding phosphorus to the drinking water in the form of either disodium phosphate or difluorinated triple superphosphate; (2) supplying phosphorus through bonemeal placed in self-feeders; (3) Fertilization of pasture with superphosphate.

—Farm Journal

Hybrid Bees May Be Next

Condensed from Farm Journal and Farmer's Wife

SINCE honey first was sweet, queen bees and drones have mated high in the air on the wing, and all of man's attempts to control bee-breeding were foiled until recently, when artificial insemination became practicable. Now hybrid strains of bees, developed along the same lines as hybrid seed corn, are in the making.

Queen bees may be (are being) "self-fertilized," just as corn is "selfed" in producing seed. A drone is hatched from an unfertilized egg, and when the dam (or queen-mother) of a drone is impregnated with sperm from that drone (her son) the process is actual "selfing," since no other parent intervenes.

Accordingly, true-hybrid bees are possible, and now are being produced in at least three apiaries in the United States. One is maintained by the University of Wisconsin, a second by the USDA Division of Bee Culture at Baton Rouge, Louisiana, and the third at Alfred University at Alfred, New York.

William C. Roberts, of Madison, Wisconsin, is one of the leading experimenters in this field. He had devised and constructed a delicate syringe from a plastic material. (Syringes have been fashioned of glass and steel, with fine points that are likely to break when handled by a novice or nervous inseminator.) The technique of artificially inseminating a queen bee seems fairly simple, but great skill and experience is required because of the tender tissues and organs involved.

The queen is held in a tapering hollow glass tub with an adjustable stopper, with her abdomen protruding. This is fastened in the field of a microscope, through which the operator watches as he adjusts tiny instruments to hold open the vaginal orifice for injection of the sperm. The syringe is steadied by a pivoted holder.

The sperm is obtained by dropping the drone into a chloroform bottle where he emitted sperm as he died. Some squeezing of the dead insect was necessary to expel all of the sperm.

But artificial insemination has not taken all of the bugs out of bee-breeding; in fact, some new ones have appeared. For instance, although the transmission of sperm from male to female has been accomplished successfully, it

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appears to cause a delay in egg-laying. When queens mate naturally they lay eggs within a couple of days, but when they are mated artificially they wait three weeks or more before they start to lay.

The broad objective of artificial insemination of bees is to develop better strains. Possibly a strain with hybrid vigor soon will be developed. Specificially, the experimenters hope to build bees with (1) a high degree of disease resistance; (2) bees that will cap the comb in one color, preferably white; (3) bees that are fairly "gentle"; (4) bees that don't swarm too easily; (5) bees that are prolific and industrious; (6) bees that are active pollinators.

There are other desirable characteristics including consistent marking by color or other identification, so that they may be recognized readily as possessing certain traits. In short, bee-breeders hope to fix the good points in a bee, and then make her tag herself.

The job isn't nearly finished yet, but is well on the way, thanks to men like Roberts at Madison, Otto Mackensen at Baton Rouge, L. R. Watson at Alfred, New York, and J. I. Hambilton, of the USDA Experiment Station at Beltsville, Maryland.

Here are some definite figures on just how much honeybees step up production of legume seed.

In Ohio it was found that bees increased clover seed production 15 times when they had complete coverage. There was a direct relationship between seed yields and honeybee population.

Pennsylvania researchers went a step further. They found that red clover grown inside bee cages averaged 50 seeds per head. That grown in the open field averaged about 30 seeds per head, and clover in cages where bees and other insects were kept out less than 1 seed per head.

The Pennsylvania folks found that bees show preference for some clover strains over others, probably because blossoms of some clovers contain more nectar than others. They also observed that some bees "worked" red clover exclusively, while others gave their full attention to alsike.

If you wish to grow clover seed, and have no hives of honeybees near your field, you might be able to persuade a commercial bee-keeper to move some bees to your farm by offering "free rent."

The Gamble Is Out of Brome

Condensed from Successful Farming

R. F. Fuellman
University of Illinois

BROME grass has swept the Midwest like a prairie fire; its merits are sung whenever farmers get together, and there are numerous good reasons for all the enthusiasm. Brome's fibrous roots prevent washing, and add needed organic matter deep in the soil.

For pasture merit, just take a look at the records made at the University of Illinois: In 1938, steers gained 343 pounds per acre when the acre yield of dry matter was 6,500 pounds. During the four-year period 1940-1943, the average acre yield of dry matter was 7,300 pounds; gains by yearling sheep averaged 306 pounds per acre. During 1942, a very favorable season, the acre gain by sheep on this experiment was 545 pounds. And one could well continue the praises of brome!

However, a stand of brome grass hasn't always been easy to get, so there yet remain many farms and farm animals without the advantages of this excellent crop. But they need wait no longer. Practical farm experience, aded to experiment-stations' research, have made brome a sure crop under normal conditions. For success with it, you'll have to observe the rules, fortunately few and simple. (1) good soil; (2) seed of high germination; (3) adapted seed; (4) seed at right depth; (5) seed with a legume; and (6) proper management.

It Thrives on Good Soil. Brome grass needs soil of good fertility. Soils low in organic matter and nitrogen usually are not suited to good production of forage. While this is true of most grasses, it is especially true with brome grass. The reason for this is found in its large yields of grass; obviously the greater the yield the higher the plant-food requirements. Yields of 6,000 and 7,000 pounds of dry matter per acre are common with brome, and in terms of pasture days per acre this quantity is sufficient for six to seven months. Chemical analyses of the forage often show an average seasonal protein content of 15 per cent.

To maintain a stand of brome in a most productive condition

Reprinted by permission from Successful Farming, Des Moines, Iowa, Sept., 1944

also requires the application of fertilizer. Manure is effective fertilizer for brome and it should be used as a top-dressing. Experience has indicated that the yield and therefore the value of the grass is in proportion to fertility.

Good Seed a "Must." New seedings of brome sometimes fail because seed is of low germination. Altho laboratory tests have shown that brome seed carefully stored germinated well after two years, it will generally be better under actual farm conditions to put your money on a fresh supply.

Time to Seed. Many farmers request information as to the best time to seed. In southern areas, best results have been obtained with late-summer or early-fall seedings. A nurse crop of small grain may be used, but the grain should be seeded lightly. In the latitude of central Illinois and southern Iowa, either fall or spring seedings are successful. In the northern sections, spring seedings with a light seeding of a nurse crop are recommended.

Brome Grass Should Be Seeded in a Mixture. Should brome grass be seeded alone? This question has been answered a thousand times and the answer is usually *no.* A legume should be seeded with it to furnish nitrogen for the grass; as a matter of fact, this should be done with any pasture or hay grass. The combined experiences of most of the experiment stations in the Central States indicate the use of a legume with brome. Alfalfa has been the favorite because it is perennial in growth habit. Sweet clover has been used by some growers, but because of its lower palatability during the second year of growth, livestock tend to graze the grass too heavily.

Within recent years ladino clover has been suggested as a legume to seed with brome grass. Too little evidence is available at present to make this a blanket recommendation. Red clover is satisfactory for seeding with brome grass where the field is used as a short-term rotation pasture. The Illinois station seeded red clover as part of a complex mixture on one 10-acre field in 1936, and brome grass at the present time (1944) still makes up more than 50 percent of the forage on that field. However, no red clover remains because red clover is biennial in habit.

Rate of Seeding. The rate of seeding of brome grass and alfalfa is a controversial question. Early experimental seedings were made using 12 to 15 pounds of brome grass and 8 pounds of alfalfa per acre. Based on the premise that alfalfa is desired for as long a time as possible and on the high competitive value of brome grass, the figures above should be reversed and 12 pounds

of alfalfa used with 7 to 8 pounds of brome grass per acre.

How to Seed Brome Grass. One of the principal drawbacks to the use of brome grass from the farmer's viewpoint is the difficulty of seeding. The seed is large and light and does not pass thru the ordinary grain drill easily. Neither is it possible to use a grass-seeder attachment. Broadcasting by hand on a large acreage is impractical. Some old-type drills with wide openings and a stirring device in the box are very satisfactory, but they are seldom available.

The following methods have been used successfully: (1) Brome grass has been hand-broadcast. (2) One hundred pounds of fertilizer with each bushel of seed (12 to 14 pounds) has been mixed and run thru the drill. (3) Endgate seeders have been used, broadcasting a mixture of one bushel of oats with one bushel of brome grass. The drawback to this method is that the oats are heavier and cover a wider area than the brome grass, therefore care must be used to overlap the oats to obtain a uniform stand of grass. Obviously, the quantity of brome grass can be varied. (4) When the grain drill is set to drill 4 to 5 pecks of oats per acre with the desired quantity of brome grass, the mixture is kept from clogging. The unfortunate tendency in this method is to drill the oats at a proper depth for the grain, which is too deep for brome. When the method *is* used, the mixture should be drilled as shallow as possible. In all cases alfalfa may be drilled on top of an oats-grass mixture in the usual manner.

A good seedbed is best for alfalfa and brome grass and many farmers use a corrugated roller before and after seeding. Some of the experiment stations have used a tandem corrugated roller, broadcasting the seed between the rollers. Where a small acreage is being seeded, broadcasting still remains the most practical method.

Its Management Is Important. Brome grass either alone or in mixture remains most productive over a long period of time if it is pastured to a height of four to six inches. Close pasturing causes slow recovery, particularly during dry seasons. Altho brome is drought- and heat-resistant, slow fall growth is characteristic when pastured closely. New fall seedings can very often be pastured during the succeeding summer. Spring seedings can be pastured during the fall, but this pasturing should be light. During wet periods, cattle should be removed from new seedings because it is during the cool fall weather that the rhizomes or underground stems begin to grow.

During the second year brome

grass usually begins to be very productive. The tendency on the part of many farmers is to attempt to pasture it to prevent seedheads from maturing. The seedheads do not destroy its value as a pasture because the leaves remain green even after the seed matures.

Brome grass and alfalfa mixtures make hay of high quality and palatability, but a word of caution should be injected here: Cut the mixture when the alfalfa is ready, then pasture the field. Two or three cuttings of hay may destroy the brome grass, especially during a dry, hot summer. The alfalfa tends to grow up and shade the brome grass so much that it has little chance to replenish its root reserves before cold weather.

Use Adapted Seed. Considerable evidence has accrued to show that there is a large variation in the adaptation of brome grass depending upon the seed source. Northern-grown seed is less able to withstand the climatic conditions of areas in the latitude of central Illinois than seed coming from the so-called southern areas. Seed obtained from Kentucky and Nebraska has outyielded northern-grown seed and in general seems to be easier to establish and maintain. The average acre yield of dry matter for a Kansas strain over a period of three years has approximated 6,800 pounds; a northern strain 4,700 pounds. An attempt to establish and maintain northern-grown brome grass in southern Illinois has failed repeatedly. Southern seed has made good.

Such are the few rules for success with brome, and farmers who have profited from grass say they are well worth following. They take the onetime gamble out of the crop (for pastures *are* crops) and get it down to simple, high-producing dependability.

Birdsfoot Trefoil

In Chemung County, New York, several fields of trefoil have stood head and shoulders above everything else in 1944. Even on steep, washy hillsides the crop thickened up, made a fair stand. In some cases trefoil was the *only* legume that survived the rigors of winter. Regular seedings consisting of red clover, alsike clover, and timothy, plus Ladino Clover, appeared better than birdsfoot trefoil on most plots the first two years, but in the third hay year the trefoil was greatly superior in yield and stand.

—*Successful Farming*

Flashes on the Farm Front

Condensed from Missouri Ruralist

Melvin L. Hayes

EACH year in the United States, lightning kills more than 400 people and wounds more than a thousand. Property damages usually range between $12,000,000 and $20,000,000 annually, in addition to the loss of thousands of cattle in the field. The farmer may be partially protected by insurance; however, many losses are irreplaceable, and those that can be replaced require much time and labor.

There probably is no other force known, however, which invokes so much fear in relation to its damage as does lightning and its partner, thunder. Many people can be helped in this respect by knowledge of what lightning is and how it behaves—or misbehaves.

For instance, there is no danger in having a monkey wrench or a pair of scissors in one's hand during an electrical storm. These mighty bolts aren't detoured that easily; neither are they "blown" into a room by a draft.

Many people contend that milking during a thunderstorm will cause the milk to sour, but this idea has been refuted. Souring is a chemical change due to the presence and growth of bacteria. If the milk is sufficiently chilled after milking, it will remain sweet.

Lightning is a gigantic spark which jumps between negative and positive charges of electricity that are built up in the clouds or in the earth. There are a hundred times as many flashes between the clouds as between the clouds and the earth.

Lightning strikes at the incomprehensible speed of 20,000 miles a second, and it is often more than a million times as strong as the ordinary house current.

The first phase of the lightning stroke is called the leader stroke; it is a tortoise compared with the giant spark which goes back up this blazed trail "as quick as a flash"—more than a million miles an hour. Then there is a steady exchange of electricity between the cloud and earth until the charges are neutralized. The fact that a stroke lasts one-one-thousandth instead of one-one-hundred-thousandth of a second, may mean the difference between a building in flames and one with just a few boards ripped off. When lengthy strokes hit green

Reprinted by permission from the Missouri Ruralist, August 26, 1944

trees, the sap often turns to steam and the trees actually explode!

As the shaft of lightning gashes thru the sky, the air is heated to an intense degree. The waves bound out and reach us in the form of thunder.

The old "sky demon" is interesting to learn about but it is difficult to reform. Fortunately, there are many precautions that can be taken in combating this force which causes 15 per cent of our fire losses.

The first and most important rule pertaining to farm buildings is to have them equipped with good lightning conductors properly installed. Lightning rods tend, in a small manner, to give off a silent discharge of electricity from the earth and prevent sparks jumping from the sky; however, this action is so small in relation to great thunderstorms, that it can be considered entirely ineffective. Since a lightning stroke searches for the easiest path to the ground, it will hit any high object, it being a better conductor than the air. Lightning rods or air terminals, being high and of a good conducting material, serve to grab strokes that might land in a given area and conduct them safely into the earth.

Completely metal or metal frame buildings with good grounds and with air terminals on non-metallic projections such as chimneys, are safest; those having metal roofs are safe only when there is metal on the sides which is in electrical connection with the roof and with grounds extending well into the earth. Buildings having sides of non-conducting material such as wood, stone, brick and stucco, must have lightning conductors.

Rods should be placed on high and projecting parts of the building and extend at least 10 inches —but never more than 60—above the highest points on the roof. There should be at least 2 paths or down-conductors that the lightning stroke may follow and these should be grounded on opposite sides of the building if possible. Air terminals (rods) should never be more than 25 feet apart.

Copper or galvanized steel of heavy quality are the best materials. All joints should be of low-resistance metal, and there must be no abrupt turns in the down-conductors.

It is very important that grounds be properly made. One of the best is attachment to an underground pipe when this is possible. If the soil is a loam over clay, or some other soil type which retains moisture, it may be sufficient merely to drive a metal rod 10 feet into the ground and attach to this.

Where the soil does not stay moist, a trench may be dug some

3 feet below the ground and away from the building for 12 feet or farther, the wire being extended in this. A very effective, but rather expensive, manner is to lay a copper ground entirely around the building in a trench, and hook all down-connections to this. The grounds should extend below the building's foundation so that the walls will not be damaged.

In wiring a silo which is adjacent to a barn, it is best to run one wire over to the lightning-conductor system on the barn, and a second one directly to the ground.

Use of electricity on farms has increased the hazards of lightning, if the equipment is not correctly installed. Lightning arrestors should be attached outside the building and properly grounded, separate from lightning conductors and at least 6 feet away.

There is an enormous loss of cattle each year by lightning strokes which hit and follow fences. A fence with metal posts is relatively safe, especially if some of the posts are extended deep. Those having posts of wood or stone should have pipes or metal posts driven at least 5 feet into the earth and at intervals of 150 to 300 feet; all the wires should be securely attached to these. In addition, long fences should have a gap of non-conducting material—wood or otherwise—at intervals of 1,000 feet.

If there is a grove of trees in the pasture, it often is best to remove lone isolated ones. If you have only a few scattered trees for shade, it may save precious stock by putting lightning rods in the tops of these trees and grounding the down-conductors in a trench extending away from the trunks.

Then, too, it is highly desirable that the farmer observe some precautions in regard to his own safety.

From a human standpoint, Old Jove doesn't have nearly as many notches on his gun as many would imagine. Forty times as many people die from falling as from lightning. However, nine-tenths of the lightning casualties are rural folk. This is due to the fact that the lightning bolts are attracted by the widely separated farm buildings, while in the cities, skyscrapers, power lines, and similar objects catch the bolts. The rural loss can be reduced by more knowledge on the subject.

When in buildings, don't stand in the immediate vicinity of down-spouts, down-conductors, near chimneys, or where some pipe, wire, or rod enters the building from the outside. Also, it is well not to stand beneath a light cord where the lightning might jump thru you to the ground, or between 2 large metal

objects such as stoves and washing machines. Cellars or basements are safe places to be if the storm is violent.

If caught outdoors avoid lone, isolated trees, hills, lone buildings, or wide open spaces. No one wants to be "down and out" but when the lightning snaps close by and you are out, it often is better also to be down. Your chances are 15 times better when hugging the earth than when standing up "like a man"—and like a human lightning rod. If possible, get into dense trees, in a cave, in a ravine or canyon, or other depression, or at the foot of an overhanging cliff. Of course, stay away from fences.

In one respect, lightning is a valuable agricultural ally, for it operates one of the world's great fertilizer plants. It breaks the air down into oxygen and nitrogen, the latter uniting with raindrops; according to estimates, 100 million tons of it falls annually from the skies.

Pellets vs. All-Mash for Growing Chicks

At the *Southwest Poultry Experiment Station,* Glendale, Ariz., six experiments were run in which comparable lots of White Leghorn chicks were fed the same ration in all-mash and pellet form. Cockerels were removed from all groups at 12 weeks of age, and the pullets continued on the experimental rations until they were 22 weeks old.

In all six experiments the average liveweight of the 12-week-old cockerels fed pellets was significantly greater than that of the cockerels fed a straight all-mash ration. In five of the six experiments, the same statement could be made regarding the pullets at 12 and 22 weeks of age.

The total average feed consumption of all chicks was slightly greater when fed pellets than when fed all-mash, and the "gross efficiency of feed utilization" also was greater for the pellet-fed chicks, both to 12 weeks and to 22 weeks of age.

There was little difference in any one experiment between the two groups of pullets as to average age at first egg, but the average age at first egg for all pullets in all six experiments was about six days less for those fed pellets than for those fed the same ration in all-mash form.

—*Poulty Science Vol.* 23:16-20

Home Grown Clover Seed

Condensed from American Agriculturist

George Serviss

FOR many years most northeastern farmers have gone to their local seed dealers in the spring and purchased their clover and alfalfa seed. Fifty years ago the story was different. It was common practice then for a farmer to produce his own clover seed or to use seed produced in his own locality.

Western seed has been plentiful and cheap; large, plump and bright. The fact that this western seed looked nicer than most home-grown and was better cleaned no doubt was a very important factor in the decline of seed production in the Northeast.

The appearance of an article greatly influences its sale but the appearance of clover seed is little better as a measure of the hay crop it will produce than the appearance of a gallon can of gasoline is a measure of how many knocks there are in it. In seed, it is the hereditary factors that are carried in the seed that count, in gasoline it is the octane rating. Neither one can be seen with the eye, but both show up in performance.

While it may have been of immediate cash benefit to farmers to switch from local seed production to the use of seed produced in distant regions, it is by no means certain, in the case of red clover, that from the long-time point of view there has been any saving. In fact, there has probably been a loss. The use of imported clover seed has probably resulted in more seeding failures, poorer stands, and shorter lived clover. These things have all increased farmers' feed bills.

Home-grown clover and alfalfa seed properly cleaned is as good as any that can be bought, except possibly that of certain new improved strains that are not yet in large scale production. Seed produced from local strains that have been grown in a community for several seed generations may even be better than the bulk of commercial seed.

Is it worth while financially? There is little doubt of that. Support prices of 28 cents a pound have been announced for uncertified common red clover and 33 cents for northern alfalfa. In addition the AAA will pay $3.50 an acre for the harvesting of red

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clover and alfalfa seed plus a payment of 3½ cents a pound for red clover and 2½ cents for alfalfa if the seed is cleaned and tested or sold to a dealer. A farmer harvesting 1¼ bushels from an acre of red clover is assured of a return of $27.

First, make sure that there is a fair set of seed. If the average number of seeds per head of red clover is 25, from 1 to 2 bushels of seed per acre may be expected depending on the stand. There is no good rule for estimating the yield of alfalfa seed. Certainly if one has to search to find pods, harvesting for seed would not be worth while. If, on the other hand, 50 per cent of the flowers developed pods it would be very worthwhile. Old alfalfa stands that are too thin to produce a normal yield of hay will usually produce more seed than thick vigorous stands.

Red clover should be harvested when most of the heads are brown and dry but before many of them have broken off. It is best to cut in the morning before the dew has entirely dried, as this reduces shattering losses. Curing may be completed in the windrow or in the cock. Unless a combine with a pick up attachment is to be used for threshing it is probably best to cure it in the cock. It may then be threshed in the field, weather conditions permitting, or be stacked before threshing. Clover hullers probably do the best threshing job but an ordinary thresher or a combine set up as a stationary thresher can be adjusted to do a good job.

Direct combining saves a lot of work but frequently much seed is lost through shattering in allowing the crop to ripen sufficiently. Some northeastern farmers leave the clover until a few days after it has been killed by a hard frost before combining. This usually results in considerable seed loss but is a quick and easy way to harvest a large acreage.

Alfalfa to combine direct must be very ripe and dry, and as with red clover some farmers wait until after it has dried following a hard frost. The largest yield of seed is obtained when about three-fourths of the pods are brownish black. It is not dry enough for direct combining at that stage but must be cured before threshing. It can be handled from then on by one of the methods suggested for clover.

Most weed seeds can be cleaned out but few of them completely. Some require the use of special expensive seed cleaning equipment. In the removal of most weed seeds from clover and alfalfa seed some good seed is taken with them, frequently a large amount. It is usually cheaper to avoid harvesting very weedy fields or weedy areas in otherwise clean fields than to depend on the

cleaning mill to remove the weed seeds. Buckhorn, curly dock and dodder are especially difficult to remove.

Farmers selling seed to their neighbors should have it tested at the State Seed Laboratory for purity and germination. A man should not sell seed to his neighbors that he would not be willing to purchase from his local dealers and use himself.

Chemistry on a Sawdust Trail

Condensed from Nation's Business

Larston D. Farrar

AMERICAN chemistry has literally hit the sawdust trail through the efforts of the organized lumber industry. The results may lead to utilization of some 25,000,000 tons of mill waste each year *and* better living for all Americans.

From mill waste — lumber scraps and sawdust—can be made wood sugar, alcohol, phenols, plastics, proteins and baking yeast. If the sawdust trail should help bring about an early victory, Americans may, paradoxically, thank Adolf Hitler. His contribution was unintentional.

One day early in 1939, Gestapo agents visited a concentration camp near Berlin. They called for Herr Erwin Schaefer, lately head of *Brennerei und Chemische Werke Tornesch*—the Tornesch Distilling and Chemical Works located at Tornesch, industrial suburb of Hamburg, then a bustling center of German "defense" work.

He came into the office of the commandant.

"Herr Schaefer," said the Gestapo leader, "I have here an agreement for you to sign. It provides that you are never to enter your plant again, that you are willing to accept a fair price for your properties, and that you will absent yourself from the German Reich."

Each of the terms represented a bitter pill for the pale industrialist. The plant he could never visit again had been built by his father and represented his own life's work. The "fair" price offered meant nothing, because he could take no more than $250 from the country. Leaving Germany meant leaving a country for which his parents and grandparents had worked and fought. He signed.

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Several days later his father and partners signed the same agreement.

Thus Hitler traded away the management and brains of a great German chemical industry in return for legal title to the plant itself—which he already controlled.

Today, Adolf Hitler has the plant and the U. S. has Herr Schaefer, who is helping write an American sequel to the story of Germany's *Universal-rohstoff*, or universal raw material, which is wood. He brought with him a process by means of which sawdust and other mill waste can be used economically to make sugar.

Manufacture of sugar from wood began in chemical laboratories early in the 19th Century. It reached serious industrial experimentation in World War I, when, as now, industrial alcohol was high on the list of critical materials and every warring nation was seeking new sources of supply. Germany, Great Britain and the United States, the most highly industrialized nations, have led in the demand for more and more alcohol.

The first American chapter was written in World War I by the U. S. Forest Products Laboratory at Madison, Wisc., which developed a process to convert the cellulose of wood into a glucose-type sugar.

Chemists in those days were spurred by the knowledge that the United States possessed—and possesses—abundant raw material. Every sawmill (and there are more than 25,000) accumulates a pile of sawdust. Every logger leaves behind debris of boughs, "slash," and other parts of trees which create serious fire hazards until burned under supervision.

Theoretically, this waste could be processed into 10,000,000 tons of wood sugar, which, in turn, could yield more than 1,000,000,000 gallons of alcohol. The nation's entire needs for 1944 are only 640,000,000 gallons, which we will have trouble producing.

Using the so-called "American" process developed at Madison, we produced considerable wood sugar during and immediately after World War I, but the method proved inefficient and as soon as blackstrap molasses became available in quantity again, wood sugar enterprises folded.

At this point, the German chapter began. It unfolded largely at *Brennerei und Chemische Werke Tornesch* where, in 1882, Richard Schaefer entered business for himself and built himself a name as well as a town. Later, into the business came his son, Erwin; his son-in-law, Oscar Loeser; and a close friend, Carl Levy. Of no industrial or chemical importance at that time was

the fact that they had "non-Aryan" blood.

The Tornesch works produced alcohol and baking yeast from grain and sugar beets, and prospered. Constantly, its chemists sought new and more abundant raw materials, because Germany had no such quantities of grain and molasses as America. That was why Herr Schaefer, the younger, was more than casually interested when, in 1926, an unknown young chemist, Heinrich Scholler, came to his office and—before his eyes—converted ten grams of sawdust into a sugar solution with no apparatus except a small tube and some dilute acid.

Dr. Scholler was in the tradition of German science. A poor man, he worked in a state-owned laboratory. He had conceived his entire process in theory, and actually patented it before he made laboratory tests.

The Schaefers decided to risk 100,000 marks in continuing his experiments. Before they were through, they had spent 3,000,000 but, instead of 16 gallons of alcohol from a ton of sawdust (the top amount obtained through other processes) they could produce 60. That changed the alcohol picture considerably. Wood now became an economical raw material for alcohol production.

This discovery impressed German industrialists. For years after 1918, Germany had studied the reasons for her defeat. The economic high command had given much thought to a treatise written by the highest ranking civilian official in the *Kriegsministerium,* or war department, Ernest Pieszczek. He advanced the theory that failure to organize food supplies, both for human beings and livestock, had cost Germany the victory. He blamed the whole 1918 catastrophe on lack of proteins.

The Scholler-Shaefer process, by this reasoning, provided a new and relatively limitless source for one thing that all Germany lacked.

Erwin Schaefer determined to devote his entire plant to wood sugar production.

The permit held by the Tornesch plant gave it the right to make alcohol from molasses and grain but not from wood sugar. Determined to seek a huge new quota, based on the new process, young Schaefer went to Berlin with the words of his father, who knew better, ringing in his ears: "My dear, crazy son."

But the elder Schaefer had underrated the impression Ernest Pieszczek's findings had made on German military and industrial minds. The elderly chief of the Alcohol Monopoly, remembering abortive attempts to make wood sugar during World War I, told young Schaeffer not to waste his time unless he could prove al-

cohol production of 50 to 60 gallons per ton of wood-waste.

"That is why I am here," Schaefer said, explaining the results of his large-scale tests.

The official insisted on an immediate trip to Tornesch w*here* he satisfied himself of the facts. In the record time of three weeks, a new quota was granted and a new company formed, chiefly to make feeding yeast to supply the proteins on which many Germans blamed their previous defeat. The head of the monopoly became president of the new concern, owned half by the Schaefers and half by the German Government.

"Which proved fatal," Schaefer says today.

That was in 1932. Hitler came into power the next year. The Scholler-Schaefer process gained wide acceptance. More than 20 such plants are estimated to have been operating in Germany in 1941. Three were built in Italy and another in Switzerland. The Japanese built one in Manchukuo and one in Korea.

But soon after Hitler came to power, a company representative was summoned to the chancellery in Berlin where he was warned by William Keppler, personal adviser to the Fuehrer himself, that the presence of men of Jewish blood would not be tolerated in a governmental partnership.

The climax was well staged. The notorious purge, when Roehm and other leaders were liquidated, was on June 30, 1934. On that same day, a company official was again on Keppler's carpet. Heinrich Himmler was there, too.

Keppler made himself plain. Schaefer and any other with the non-Aryan "taint" must be ousted in three days.

The board of directors surrendered, and Schaefer, no longer a director, continued to occupy his offices, from which he directed his other interests. But his security was brief. On November 10, 1938, Von Rath of the German embassy in Paris, was slain by a Polish Jew.

When Schaefer and his partners got off the train at Tornesch that day (they all lived in Hamburg), two of their own employees who were high in local Nazi Party circles, arrested them and led them to the town jail. Ironically, they had given that jail to the little one-industry town as a community contribution several weeks before.

"I believe we were the first to occupy it," says Schaefer.

From jail, they went to the concentration camp.

In March, 1939, Schaefer, his aging father and mother, his wife and three children, and his two partners, arrived in England. Not until July, 1940, was he able to

come to the United States under an immigration quota.

Immediately after coming to this country, Schaefer was instrumental in organizing the American Wood Sugar Company, becoming its vice president, but, discouraged by official indifference, he halted this enterprise.

Finally, employed as a consultant by the Timber Engineering Company, affiliate of the National Lumber Manufacturers Association, he was able to interest the Office of Production Research and Development in the process. Since then, under the general supervision of Dr. J. A. Hall, chief bio-chemist of the U. S. Forest Service, pilot plant tests of Schaefer's process have been made at Marquette, Mich., using facilities lent by the Cliffs Dow Chemical Company. The cycle of the process has been shortened from 18 hours to about five hours.

Now, the Willamette Valley Wood Chemical Company has been formed and is seeking permission to build America's newest wood sugar plant at Springfield, Oregon. Other projects are in the making.

Wood sugar opens a new vista to those who have never considered the chemical possibilities of the new age of wood. There are those who now believe that many forest industries which heretofore have always dealt with wood *mechanically* may turn also to chemistry. Wilson Compton, president of the Timber Engineering Company, said recently:

"The history of the American lumber industry has been written with a sharp saw. Its future may be written with a test tube."

If so, a German refugee's name will be hailed in his adopted land where he works to defeat the man who stole his fatherland.

Grainless Lamb Production

Condensed from The Business of Farming

J. P. Bonfield

I get a good price for my lambs, but the cost of grain for feeding, cuts into my profits too much."

This remark is often made by sheep growers. But the Purdue Agriculture Experiment Station seems to have found the answer to that problem. For their lambs went from pasture to market without grain and every one of them graded 'choice.' This record was set in 1943, when 64 lambs grazed on a pasture of Ladino clover, timothy and brome grass. There were 64 ewes and 64 lambs on the 20 acres.

"These were the outstanding lambs of the season," was the comment of the packers. "They

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outdressed the general run of lambs 5 to 6%."

Ladino clover, a new pasture crop now being tested in Indiana, is a mammoth type white clover, introduced in this country from Italy in 1903. Tests have indicated that it is sufficiently cold-resistant to be satisfactory in temperatures similar to those of Indiana.

This variety of clover is shallow rooted, and makes little growth during dry, hot weather. It will, however, tolerate wet soil conditions for short periods of time. It should have a soil well supplied with phosphorus, and its lime requirements are similar to those of Alsike clover.

Since Ladino clover has a high moisture content, it is difficult to cure for hay. Therefore it is much better suited to pasture use than for hay.

During this Purdue test, other lambs from the same flock were grazed on an alfalfa-brome grass mixture, but did not make as rapid or satisfactory gains as those grazed on the Ladino clover and grass. Ewes on this latter plot gained from 50 to 98% more than those on the alfalfa-brome grass mixture.

The use of Ladino clover is not restricted to the grazing of ewes and lambs. Its performance in furnishing green, tender succulent and nourishing growth has made it a favorite for poultry ranges in the middle Atlantic states, especially in Pennsylvania.

"I have saved as much as 35% of purchased feed on my poultry that ranged on Ladina clover," is a statement made by a successful poultry grower with long experience. Others find that the feed requirements of poultry are from 10 to 35% less.

Such reports indicate that there is a promising future for Ladino as a pasture crop. If it continues to make records like these two, the one in lamb grazing and the other on poultry ranges, it will turn out to be a real money maker for farmers.

Unfortunately, this crop has come into popular favor so recently that seed is not available in all parts of the country. Usually from one to two pounds of Ladino clover seed is sown per acre, in combination with various grass mixtures. It spreads by creeping stems which root at the joints. Thus, during the first year of growth, one plant will cover several square feet of ground.

The season for sowing varies in the different states, but in general both the season and the seed bed requirements are similar to those for alfalfa or other clovers. Ladina bids fair to become a clover greatly in demand, and one which when properly used will be an important money saver in various fields.

Deep vs. Shallow Tillage

Condensed from Market Growers Journal

C. W. Kelsey

WHAT I am going to say about deep tillage is the result of my observation of crops grown in ground that has been tilled deep, in comparison with crops close by in ground prepared in the conventional manner with plow, disk and harrow, other factors being the same, and from reports that I have checked from growers, who practice this new kind of deep tillage. These observations go back to 1930. There are more than 5,000 growers in the United States who depend on this deep tillage.

I have found deep tillage is comparatively new. Ordinary plowing varies; four, five, six inches deep are practiced. Seven inches deep is generally considered *deep* plowing. I do not mean to imply that much *deeper* plowing is not practiced. What I do means is that over seven inches deep is exceptional, and that most plowing is between four and seven inches, or an *average* of five and one-half inches deep.

The results that I have been most interested in are from a machine that completely stirs the ground in one operation to a depth of between *six* and *ten* inches or to the average depth of *eight* inches, an increase of depth of *two* and *one-half* inches, as compared to conventional tillage by plow, disk and harrow. This additional two and one-half inches means more root room, better anchorage, more room for plant food, more moisture area, less opportunity for hot summer suns to withdraw the moisture. In other words, there is made available almost *half again* as much of these desirable seed bed qualities by simply tilling *two* and *one-half inches deeper.* I do not think shallow tillage has anything to offer to offset these advantages.

Now, what are the results of this deeper tillage? So far as my observations go, they are always good. I have never known of adverse results. However, in this new kind of seed bed, many other things are accomplished by this new kind of soil preparation. All the soil is aerated. It is completely pulverized. There are no *large chunks* of dirt left, with resultant air pockets. Manure and fertilizer are completely and thoroughly mixed throughout the seed bed from top to bottom. No

Reprinted by permission from the Market Growers Journal, Louisville, Ky., Aug., 1944

hard pan is created, as with the bottom of a plow to check water absorption. Instead the ground is put into the *best possible* condition to absorb moisture and *retain it* without puddling. Valuable cover crops are not turned *under* to the *bottom* of the furrow, where part of their vital elements are leached off to lower ground, *never* to be recovered. Instead, in this new kind of deep seed bed, all plant food is evenly distributed from *top* to *bottom* where it is ready and waiting for young, hungry, tender roots near the top of the bed and just where it is wanted as the roots and plant grow.

Results from this kind of deep tillage are early yields, healthier plants, more abundant and more profitable crops, with better results in drought than are usual from conventional tillage.

From my 14 years' experience, I am convinced this new deep type of tillage is going to revolutionize tillage methods. One skeptic, thought this new deep type would destroy the earthworm and thus do great harm. Here is the answer to that question from Mr. Christopher M. Gallup, of the Bio-Agronic Associates of North Stonington, Connecticut, possibly the best authority on earthworms in this country. He writes:

"I have used this new type of tillage continuously for the past fifteen years. This type of tillage may kill an occasional earthworm, but only those too small to have established themselves in their standard vertical burrows. Last Friday we were picking the stones from my 1944 garden plot, already tilled twice this year. The earthworm burrows made after the second tillage were close enough together to indicate an occupancy of around 500,000 per acre. I do not now recall having seen a single casualty among them.

"During the years that we used a mould-board plow, our hoed crops almost always suffered for lack of moisture. Now our corn stands up lush and green while that of the neighbors curls in the hot sun. I know of no better way to hold moisture in the soil than by maintaining a dust mulch, and I have come to believe that a soil so thoroughly aerated, carries a lot more nitrogen fixing bacteria than otherwise.

"Regarding the fineness of tilth, I cannot imagine any mechanical operation that would turn out finer particles than what come from an earthworm's gizzard, and their effect on plant growth is all to the good. I know because I have filled earthen pots with worm castings just to find out."

Mr. Gallup, in his experimental farm, has been producing most unusual yields, far above average, and he attributes these re-

sults to two things, (1) earthworms, (2) this new kind of deep tillage.

Summing up, it is my belief that deep tillage well done, as compared with shallow tillage, will pay substantial and worthwhile dividends on the additional cost of preparing this deep seed bed over the cost of preparing a shallow seed bed. I will even venture so far as to say that 12-inch deep tillage, in good, properly prepared potato ground will produce almost twice as much tonnage of potatoes as will a shallow bed only 6 inches deep that has a hard plow sole.

Our "Chinese" Food

Condensed from Marketing Activities

Emmett Snellgrove

THOUGH U. S. rice production is an insignificant part of the world supply, American rice growers and millers after meeting our own wartime needs are today shipping rice to many distant lands that formerly looked to rice-wealthy Burma, Thailand, and Indo-China for their supplies. Thus, a country many of whose people still refer to rice as a "Chinese" food is now providing nearly half a billion pounds of it annually, all milled and ready to cook, to feed the world's deprived people.

The United States is of course not able to supply *all* the rice needs of these countries, but acts merely on a tide-over basis until the Burma area can be reopened. Until then—and provided our record-breaking supplies last—American ships will continue to deliver rice to our territories, our allies, friendly nations, and liberated areas.

As a nation, we Americans are not a rice-loving people. For generations, we have eaten and used industrially only 5 or 6 pounds per capita—800 million pounds a year. The rest of our peacetime 1,400-million-pound milled production went and still goes principally to Cuba, Puerto Rico, and Hawaii.

Our present increase in production, some 300 to 400 million pounds a year, is going almost entirely to areas that never before depended upon us for sup-

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plies. These include the United Kingdom, Russia, west Africa, and unoccupied France.

Literally speaking, rice *is* a Chinese food. It is generally believed to have been cultivated first somewhere in the area extending from southern India to Cochin-China far back in antiquity. It appears to have spread into China possibly as early as 3000 B. C., and much later into Iran, Arabia, Egypt, and finally Europe.

Many centuries later—about 1685 — ambitious farmers in South Carolina began experimenting with it. They were followed by farmers of North Carolina and Georgia. Since the Civil War, however, rice production has centered largely in Louisiana, Texas, Arkansas, and California, and these four States, led by Louisiana, produce all our commercial rice.

Grown largely in the South, rice has remained largely a southern food. Hence, the average per capita U. S. use (6 pounds a year) does not reflect the heavy consumption in the South. On a State basis, the per capita consumption ranges from less than a tenth of a pound in New Hampshire and Vermont to 27 pounds in South Carolina and over 40 pounds in Louisiana.

Rice is rich in starch and high among low-cost energy-supplying foods. Milled rice (processed from rough rice) is completely edible and has little moisture and a fairly high caloric content. It contains calcium, phosphorus, and iron, among minerals, and thiamine, riboflavin, and niacin.

A nutritional weakness of rice long has been that white (milled) rice lost much of its vitamin content in the milling process. Recently, the development of a process for preserving a large part of the vitamin values has received widespread publicity, but only a small fraction of the country's production is being processed by this method at present. Brown rice has a higher food value and more flavor than white rice because it contains the bran and germ portions not found in completely milled grain.

Rice millers in the producing areas receive it from the farmer in its rough state, then process it into the product you find on grocery store shelves.

The harvest season begins in the southern belt about August 1. Rough rice reaches the southern miller in 162-pound units (the California unit is 100 pounds). After milling, the 110 pounds or so of milled rice that remain are divided as follows: Whole rice, 80 pounds; second head (half-grain), 14 pounds; screenings (quarter-inch), 12 pounds; and brewer's rice (small, finely broken pieces), 4 pounds.

The residue — the difference

between the 162 pounds that went into the mill and the 110 pounds that came out as milled rice—consists of approixmately 32 pounds of hulls, 15 pounds of bran, and 5 pounds of polish. Hulls are used as fuel, largely by the miller; bran as stock feed; and polish, brownish and flour-like, in food and pharmaceuticals.

The whole-grain milled rice is used entirely for food, as is some of the half-grain product. Most of the second-head, screenings, and brewer's rice, however, goes into industrial uses, principally by brewers and into rice starch, for which there is a considerable wartime demand.

That starch demand, by the way, is an interesting angle. Few people know that rice starch is much used in the manufacture of tracing cloth, an essential in wartime construction. To design a single one of Uncle Sam's biggest battleships requires more than 300,000 square feet of it.

In 1943, American rice farmers chalked up two records—in production and acreage. The 70,025,000-bushel crop grew on 1,500,000 acres for harvest. This production exceeded by about 8 percent the previous record crop (1942) and was 48 percent above the 10-year (1932-41) average of 47,334,000 bushels. The average per acre yield in 1943 was 46.7 bushels compared with 44.5 bushels in 1942 and the 10-year average of 48.4.

In the three southern rice States—Louisiana, Texas, and Arkansas — 1943 production reached nearly 56 million bushels compared with 52 million bushels in 1942.

In Louisiana most rice is produced on small, individually owned farms where other crops also may be grown. In Texas, operation is on a larger scale with rice farms ranging up to 6,000 acres. Arkansas follows both systems, but smaller farms predominate with an average of about 160 acres (mostly in rice).

Performance or Show Ring Qualities?

Condensed from The Dakota Farmer

THERE is a U. S. Range Livestock Experiment Station located at Miles City, Montana. It has been carrying on beef cattle research work since 1924. They have 56,300 acres of land and run between 1,600 and 1,700 head of cattle. Since 1938 they have been concentrating on beef cattle breeding projects. They have done such fine work that the Station is now receiving international recognition for its work with beef cattle.

"Beef Cattle Breeding and Record of Performance" is the name given to one of the interesting beef projects. This project has two purposes: (1) To develop methods of measuring economic qualities in beef cattle, and (2) To develop superior strains of beef cattle for economic production of meat of high quality.

The idea of "performance testing" beef sires is not new. Early breeders "performance tested" their animals because they saw the value of such tests in developing a more useful kind of cattle. Later, fat stock shows became more prominent and progeny-testing of beef bulls was replaced by the show ring. Great strides in standardizing type have been made through the show ring but selection for rate of gain and efficiency of production has not been given much consideration. Few breeders cared how much feed an animal ate provided it won in the show ring. The purposes of the methods of selection used by the Range Station are to measure not only the carcass quality of steers slaughtered but the rate and efficiency of grain as well.

To develop superior strains of cattle the Range Station has undertaken a long-time study requiring many animals. The present herd is divided into three lines of cattle and another unrelated group of test-herd cows. Bulls selected for tests are bred to 25 to 30 random-selected cows from the test-herd group.

In the 1943 breeding season, 10 test herds were bred to 8 yearlings and 2 two-year-old bulls at the Range Station and 4 more bulls were used in test herds at the North Montana Branch Station, Havre, Montana. The cows were random-selected so that no one bull has any advantage over any other. The calves sired by these bulls are fed out in record-of-performance tests; and, unless they sire efficient and rapid-gaining calves, the bulls are not

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used for further breeding. Those kept (based on the records of their calves) are used in the line herds for the production of the next generation.

The results of these tests of purebred Hereford bulls on random-selected test-herd cows should be of interest to every cattleman. During the 1942-43 feeding season, the steer progeny of six bulls bred to test-herd cows were fed out. The results of the performance test are shown in the table on this page.

A study of this table shows that there was one outstanding sire as judged by the performance of the steer calves. L1B Domino 2nd was first in nearly every comparison. Although the steers by L1B Domino 2nd ranked third in weight at the beginning, they finished nearly 100 pounds heavier than the next sire, L1C Domino.

In return per steer above feed and marketing costs, L1B Domino 2nd steers returned $83.47, which is nearly $16.00 more than the next best bull. The best bull on performance test, L1B Domino 2nd, is a big, rugged bull but not a bad looking animal. L1C Domino is a small, refined bull and Mixer Domino 2nd is about average in size but carries more flesh than any of the others. Cactus Domino is big, rugged, and fairly thick of flesh and from the standpoint of appearance would be judged a good range type of bull.

The point to remember is that there seems to be little association between conformation of bull and performance of calves, although there are indications that the larger bulls, at a given age, produce the calves that perform well in the feed lot. All this study leads up to the question as to whether or not more attention should be given to record of performance than to show ring qualities.

Sire	Cactus Domino	Bison Domino	Alton Domino 2nd	L1B Domino 2nd	Mixer Domino 2nd	L1C Domino
Weaning weight ...	394	412	370	411	370	422
Final feed lot wt. ..	902	902	884	1084	885	938
Gain in feed lot ...	508	490	514	623	515	516
Daily gain in feed lot	1.86	1.79	1.88	2.28	1.89	1.89
Grain per 100 lbs. gain	588	617	579	567	589	623
Hay per 100 lbs. gain	198	202	163	158	150	166
Slaughter grade ...	Good	Good	Choice	Choice	Choice	Choice
Carcass grade	Good	Good	Choice	Good	Good	Good
Sales value per steer	$127.69	$126.04	$122.61	$153.28	$126.42	$130.64
Total feed and market costs	60.00	60.53	58.71	69.81	59.61	63.21
Returns per steer ..	67.69	65.51	63.91	83.47	66.81	67.43

More Beef from Fewer Cattle

Condensed from Farm and Ranch

Virgil S. Beck

PROPER range management means more meat *now*. That is what John Harris of La Plata, New Mexico, one of the co-operators of the San Juan Soil Conservation District maintains and he is ready for a friendly debate with any rancher who thinks that wartime demand for food warrants keeping herds of cattle above the forage supply.

His argument is based on his own experience. After he began culling out excess stock and following other range-improvement practices, he found that the average weight of his weaners climbed from 375 pounds in 1937 and 1938 to more than 425 pounds in 1943.

A little further calculation revealed that he actually had increased his gross shipments of stock after cutting the size of his herd by one-third! These figures don't tell the whole story, either. There is, of course, less overhead in running the smaller number of cattle—and a proportionately bigger calf crop.

When Harris first came to the San Juan Basin up in the "four corners" county, in 1907, the range was still in poor condition from past over-use. The Harris ranch was open to trespass, and as newcomers and "nesters" they didn't find very much encouragement.

The low prices and the drouth of the early '30's were a severe blow to all of the cattlemen in the Basin, and the Harrises were no exception. Prices wouldn't even pay the shipping costs for cattle, and stock was left to multiply and trample the dying grass.

But John Harris and sons were not discouraged by their bad luck—and they were not afraid of new ideas. In 1938, when the Soil Conservation Service came along with proposals for range improvement, the Harrises were among the first to sign a co-operative agreement.

Harris tried out all the suggestions of the Service. He plugged his gullies, installed small brush and rock "percolators," built several new stock tanks, maintained rotation grazing, experimented with reseeding, and—at the point where some other conservation - minded ranchers balked—began cutting down his herd to fit the grass supply.

The reseeding program was

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tried out on fields formerly used for dry-farming, and it was not spectacularly successful. He planted Western wheatgrass, galeta, blue grama, Indian ricegrass, and sand dropseed. The wheatgrass, dropseed and ricegrass are revegetating the 300 abandoned acres, but it has been a slow process in a short-grass country where the rainfall averages only about 6 or 7 inches during the growing season. Some other ranchers were amused by the lagging spread of the grass on the former cultivated tracts.

However, the skeptics can hardly doubt the over-all value of Harris' open-minded experimentation with range development, for each year has seen a steady improvement in his land, until at present the average density of the grass on former severely damaged areas is double that on several pastures adjoining his ranch.

There are no barren hillsides on the 10,000 acres of Harris range. Headcuts have begun to revegetate, and grass covers places that used to be nothing more than raw, crumbling earth waiting to be swept into the San Juan river by the next downpour.

In culling his herd, Harris keeps a constant eye on the improvement of breeding stock. He attends most of the big Hereford sales in search of good lines.

He also pays close attention to the supplemental feeding of his animals, and the irrigated land he has developed is devoted largely to the raising of alfalfa which subsequently is marketed as beef.

Conservation practices become dividends to Harris when it comes to farming, too. His land was under irrigation before SCS came into the picture, but the agency offered him technical assistance in leveling his fields, putting in new headings, and relocating ditches. Learning of the success of experiments with the use of superphosphate on legume crops, Harris began applying it to his plantings of alfalfa. He also adopted a system of rotating the alfalfa with his winter wheat and barley.

As a result of the proper application of irrigation water, preservation of the topsoil, and the practice of returning organic matter to the land, Harris figures he has increased his crop production at least 20 per cent—another way of providing more and better feed for his stock.

"More beef cattle from fewer cattle" may seem to be a funny kind of reasoning. It isn't to John Harris. He knows that it is a business formula that works.

Sheep Pregnancy Disease May Be Prevented

Condensed from Sheep & Goat Raiser

Dr. W. H. Lytle

Chief, Division of Animal Industry, Oregon State College

IT IS estimated that nine out of each ten pregnancy-disease sick sheep die and most of the lambs from these sick mothers are also lost. This disease is known by a dozen more or less descriptive names, however pregnancy disease seems to suit the malady best, with the name pregnant ewe paralysis next best.

The exact cause of the disease is not known, but it is known to be a disease of ewes in advanced pregnancy, those carrying twins or triplet lambs being most apt to succumb, and it is usually during the fourth month or in the fifth or last month of pregnancy that the malady occurs. It is clearly a disease of faulty assimilation of food, together with faulty elimination of waste products.

The ewe is the hardest working animal on the farm. She produces often twin lambs weighing as much as 10 pounds each or nearly one-sixth of her body weight, and also a 10-pound wool clip, bringing the crop taken from her body to nearly 30 pounds. She is preparing at the same time to give up for a period soon after lambing, a couple of quarts of milk daily testing 6.9 per cent in fat content. Hence it should be expected that unless there is an abundant water intake that the waste nitrogenous end products will not be washed out of the tissues of her body by water elements carried by the blood to these tissues, which waste products are later separated from the blood in the kidneys and pass out with the urine.

Different theories are at hand as to just what happens to cause this catastrophe. Glucose such as that seen in molasses or Karo syrup is known to be helpful as a preventative; some say the excess proteins are burned up, so to speak, in the carbohydrate fires in the system. Others feel that carbohydrates generate heat in the system and produce thirst, thus causing greater water intake. Exercise also tends to burn up stored up nutriments in the system producing heat and thirst, and likewise causing a greater water intake, and thus aids in elimination of nitrogenous waste

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end products. There thus seem to be several methods of handling ewes so that the chances for their developing pregnancy disease is lessened.

The group of contributory factors are, of course, first, pregnancy, then poor or improper feeding, lack of exercise and an insufficient water intake. Vitamin A deficiency also plays an important part.

Improper feeding may be corrected generally by feeding more easily digested forage such as alfalfa or legume hay, well cured and bright green color, to insure sufficient vitamins. Grains that are of good quality must be fed. If the hay is coarse, less hay should be fed and more grain. Oat hay that is coarse is not good hay for sheep; it is constipating and carries too much cellulose or waste products which only add to the pressure symptoms and faulty elimination when twins are carried in the ewe's side.

Warm water from a spring or pumped from a well during cold weather will tend to increase water consumption. A tank heater will be helpful if the water is cold from being allowed to stand in the trough. For those ewes that must drink from a creek or from surface water, glucose-yielding foods such as molasses, or if not available, beet pulp will be helpful. Also forced exercise is helpful. Ewes may be induced to trail behind a hay wagon when hungry or regularly fed away from the barn. This will cause the ewe to take the much needed mile or two-mile exercise. Slow gradual exercise should be the best.

In treating ailing ewes one-half pint to one pint of molasses given as a drench twice a day will be the most helpful thing that flock-owners can use. Veterinarians could administer glucose solution intravenously probably with some benefit.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

An Agricultural Testament—By Sir Albert Howard, C.I.E., M.A., former Director, Institute of Plant Industry, Indore. Oxford University Press. $3.50.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Dairy Cattle and Milk Production — By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

Dairy Science — By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Diseases and Parasites of Poultry — By Edgar Hugh Barger, D.V.M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition (1943). $3.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Farm Management and Marketing — By V. B. Hart, M. C. Bond, L. C. Cunningham, all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. (1942). $2.75.

How to Raise Rabbits for Food and Fur — By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. (1943). $2.00.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Livestock Judging Handbook — By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

Modern Agricultural Mathematics — By Maurice Nadler, B.S., A.M. Dept. of Mathematics, Newtown High School, Long Island. Orange Judd Publishing Co., Inc. (1942). $2.00.

Modern Farmers' Cyclopedia of Agriculture—By Earley Vernon Wilcox, Ph.D., Agricultural Writer, formerly with U. S. Dept. of Agriculture. Orange Judd Publishing Co., Inc. (1944). $4.50.

Natural Principles of Land Use—By Edward H. Graham,, Chief of the Biology Division of the Soil Conservation Service. Oxford University Press. 275 pages. $3.50.

Plowman's Folly—By Edward H. Faulkner. (1943) Grosset and Dunlap. $1.00.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Profitable Poultry Keeping — By H. Clyde Knandel, Prof. and Head, Dept. of Poultry Husb., Penn State College. Orange Judd Publishing Co., Inc. $3.00.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Practical Horse Breeding and Training — By Jack Widmer. Charles Scribner's Sons (1942). $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Soil Conservation — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

The American Land—Its History and Its Uses — By William R. Van Dersal, biologist in the United States Department of Agriculture. Oxford University Press. $3.75.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.

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BOOK NOTES

PRACTICAL FARMING FOR THE SOUTH—by Benjamin F. Bullock, now Professor of Rural Education, Atlanta University, Atlanta, Georgia.

This handbook answers many questions for the small farmer who, in addition to his cash crops, is trying to raise the food for his family and livestock, improve his soil, and make the best use of his time and his land. Although intended for the South, much of the information may be applied or adapted to other parts of the country.

Publishers: The University of North Carolina Press 510 pages $2.50

ROOTS IN THE EARTH — The Small Farmer Looks Ahead — by P. Alston Waring and Walter Magnes Teller, two independent small farmers who have written out of their own experience.

This book is a happy combination of the hard facts of farming with the ideals and aspirations of the farmer. The authors contend that the family-size farm can again provide an agreeable way of life provided small farmers adjust their social outlook as well as their techniques of agronomy and animal husbandry to the new agricultural situation they confront.

Roots in the Earth is not a book just for farmers but for every American who is interested in establishing on firm foundations that essential part of America's economy which has its roots in the earth.

Publishers: Harper & Brothers 202 pages $2.50

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